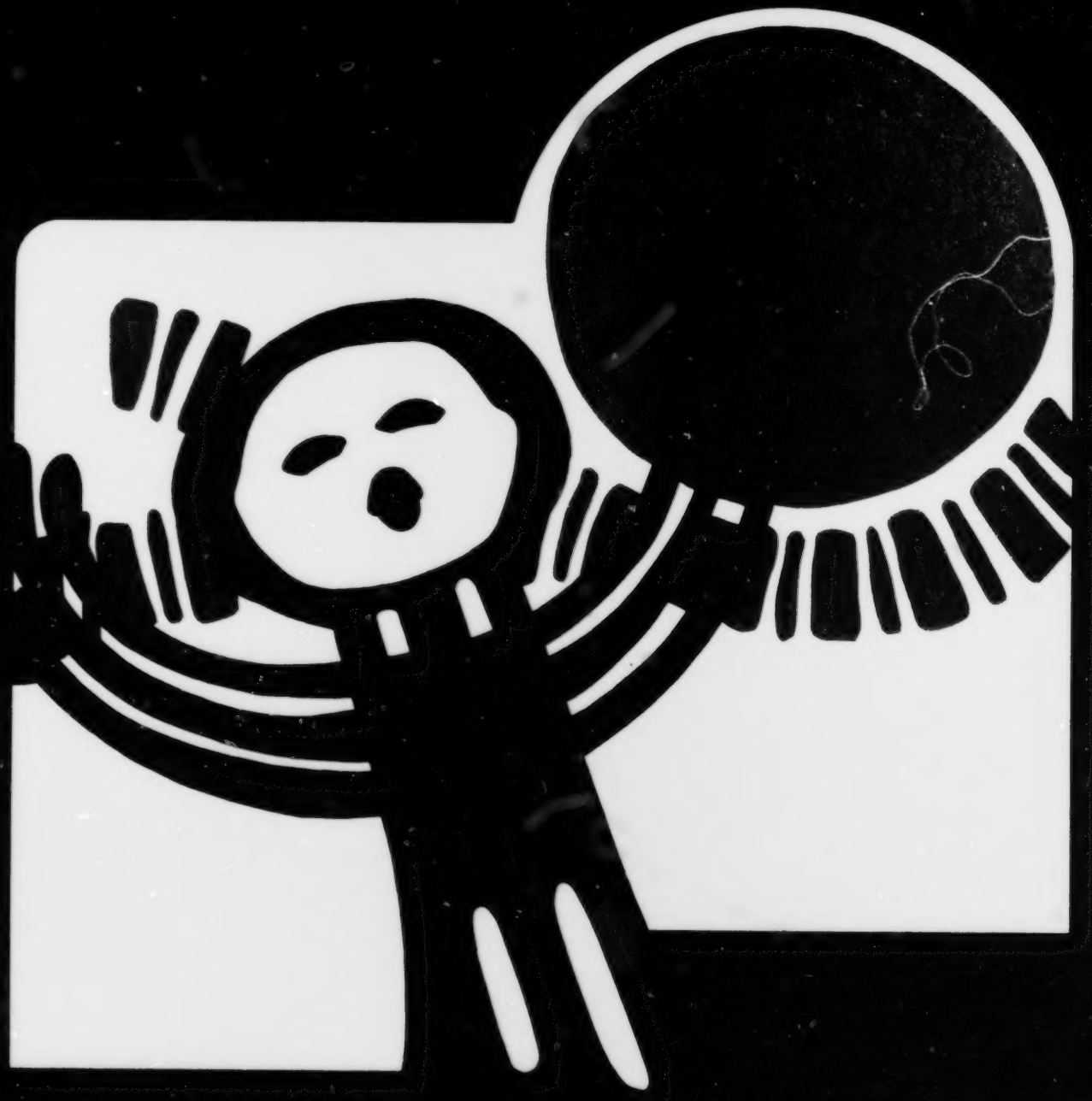
YOUTH and the ENVIRONMENT



Alberta

86-01566/

A YOUTH DECLARATION ON THE ALBERTA ENVIRONMENT TO THE YEAR 2000

Papers and Concensus from

YOUTH AND THE ENVIRONMENT CONFERENCE

June 1, 2, 1985

Edmonton, Alberta

YOUTH AND THE ENVIRONMENT

On June 1-2, 1985, at the University of Alberta the Environment Week Association of Alberta sponsored a youth-oriented conference on the Alberta environment. Seven youth groups presented on issue areas of interest to Albertans now and in the future.

These presentations are recorded in the following materials. As well, a paper, A Youth Declaration on the Environment to the Year 2000, was written to report the consensus expressed by the youth on the last day of the conference.

The preparation, printing and distribution of this document was made available through the services of the Legislative Planning and Media Information Division, Alberta Environment.

Conference Organizers:

Mr. Lubomir Wotjiw, Public Advisory Committee, Environment Council of Alberta
Mr. Brian Staszenski, Environment Resource Centre
Ms. Anne Marie Downey, Environment Canada
Mr. Rob Lee, Alberta Environment
Mr. Jim Martin, Alberta Environment

Environment Week Association of Alberta
642-21, 10405 Jasper Avenue
Edmonton, Alberta
T5V 3S2
Ph: 427-6310

ACKNOWLEDGEMENTS

The Environment Week Association of Alberta acknowledges the support and contribution of the following in making the Youth and the Environment Conference a success. Without the varied contribution of these individuals and organizations the Youth Declaration on the Environment would not have been made.

Ft. McMurray Composite High School

University of Alberta Conference Services

Medicine Hat School Distric #76
- Dr. Kenneth Sauer
- Mr. Arne Handly
- Mr. Gary McFarlane

Pincher Creek School Division #29
- Dr. Haze Wescott
- Mr. Lowell Holland

Yellowhead School Division
- Mr. Don Junol

Syncrude Canada Ltd.

Suncor Canada Ltd.

Esso Resources Ltd.

Environment Council of Alberta

Environment Resource Centre

Friends of the Earth

Junior Forest Wardens

Dr. Arnold Lamb, Stanley & Associates Engineering

Metis Association of Alberta

Alberta Environment Network

Environment Canada

Alberta Energy and Natural Resources

- Alberta Forest Services, Forestry Youth Programs
- Fish and Wildlife Division, Public Information and Extension

Alberta Agriculture, 4H Branch

Alberta Recreation and Parks

- Volunteer Services Section
- Visitor Programming Section

Alberta Environment

- Community Affairs Branch
- Communications Branch
- Water Resources Management Services
- Environmental Education Branch
- Air Quality Control Branch

TABLE OF CONTENTS

Youth Environment Declaration 1

Appendices 3

Medicine Hat High School 4

Harry Collinge High School 21

University of Alberta, Faculty of Education 29

Alberta 4-H 34

Fort McMurray High School 41

Matthew Halton Community School 52

Conference Participants 69

YOUTH ENVIRONMENT DECLARATION

We, the Youth of Alberta, do hereby make this declaration to encourage today's decision makers to improve and protect the quality of our environment, so that they will be able to pass on to us, tomorrow's decision makers, a full measure of the earth's bounty.

In just over a century Alberta has changed from a hunting and trapping economy into one of the richest provinces in Canada. Natural resources form the basis of this wealth. Agriculture, forestry, and oil and gas production are the cornerstones of our economic well-being. The wise use of these resources is paramount to our survival.

The grain fields of Alberta feed millions of people around the world. A scant few inches of topsoil provides this food. Yet we continue to use tillage practices which rob the soil of its nutrients and water and which encourage erosion by wind and water. With proper husbandry these soils will last forever. Without proper husbandry, these soils will be gone in a generation, doomed to be blown away like the dust of other great civilizations which failed to protect their resources.

The eastern slopes are not just a source of resources. They provide important habitat for wildlife, an important source of water for most of the major rivers in Alberta, and recreation for hundreds of thousands of Albertans. The Eastern Slopes Policy was developed in a public forum and reflects the concerns of all Albertans. Changes to that policy must also be carried out in a public forum.

Our forests are disappearing at an alarming rate. Nearly a century of exploitation with low reforestation is forcing the industry to seek new sources of trees in marginal areas. There is pressure to allow the industry to harvest in protected wilderness areas. We cannot 'mine' our renewable resources. Forest replacement is a major problem that must be addressed now.

Water resources in Alberta are limited and not equally distributed. Sections of many rivers are badly polluted. Much of this pollution is not the visible kind, that creates offensive odours or obvious eyesores, but the invisible kind, like heavy metals, whose effect on humans is not fully understood. These are the by-products of a complex, technologically advanced society, which does not fully understand the environment in which it lives. Dams and inter-basin water transfer proposals are complex ecological, economic, social, ethical, and political problems which require mandatory full and open discus-

sion with all citizens while plans are still in the proposal stage. A proposal should not be an assumption of approval in these cases.

Acid deposition is a problem affecting air, water, and soil. While we understand that a major industy-government study is underway, we question the forces that permit potentially harmful substances to be freed into the environment without recourse to industry penalties. The earth should not be a laboratory where we can indiscriminately conduct experiments on the plants, animals and humans that depend on the air water and soil for life.

Education is a major concern. The Youth and Environment Conference provided a rare opportunity for students to discuss their ideas with their peers. An on-going environmental awareness program is required in our schools to involve students in environmental problems. Proper education now will prepare the youth of today for their role in the future as concerned leaders. Education about environmental problems and issues should not finish with the end of formal education. An on-going program of issues education for adults is required. This program should include support for formal courses, conferences and forums, as well as readable material discussing issues. The government should support on-going environmental research and make the results available, in an understandable form, to the public. Education provides the framework within which we view the world and function as citizens. The involvement of citizens in major policy-making decisions is vital to good government. The free flow of information and open discussions of environmental issues in public forums will help citizens to participate fully in environmental policy-making.

Your legacy is our assets. We have to live in the future you create. We will build on your good decisions. We must answer for your mistakes.

APPENDIX

These papers were researched, written, and presented by Alberta High school students at the Youth and Environment Conference in Edmonton on June 1 and 2, 1985.

In the paper on water diversion, each student took one facet of this problem and explored the implications of water diversion on this particular problem.

In the paper on the Wilmore Wilderness Park each of the students explored the question of resource exploitation from a particular point of view.

The paper on air quality is a research report on the government-industry co-operative air quality monitoring system in Edmonton.

The paper on soil conservation presents compelling arguments for some fundamental changes in the way dry-land farmers practice tillage.

The report on the Three Rivers Dam presents pro and con issues resulting from the building of a major dam on the Oldman River in Southern Alberta.

The students from Fort McMurray presented a well documented research paper on the impct of acid deposition from tar sands developments.

In all, the papers explored a wide variety of viewpoints on the topics and allowed students to present their ideas to a forum of their peers. The conference gave students from all over Alberta a chance to discuss their ideas and thoughts on some of the fundamental environmental issues of today.

Youth and the Environment Conference, 1985

MEDICINE HAT HIGH SCHOOL PRESENTATION

Group Members: Cindy Campbell, Michelle La Brosse, Gerrit Winkelaar, Leela John, Craig Bucholz, Todd Gehring

Issue: Should water be diverted from Northern Alberta to meet the needs of Southern Alberta?

"Is there a need for diversion?" (Cindy Campbell)

Rerouting of water from northern to southern Alberta: only the suggestion raises many controversies. This issue has been debated for years and involves many, many different problems.

The primary use for diverted water would be irrigation. In 1977, 96% of the water taken from the South Saskatchewan River was used for irrigation. One of the first questions which arises from this issue is whether extensive water diversion is really necessary. There are two sides to this question obviously. Some say definitely yes, while other take a firm stand against it; still others offer a position somewhere in the middle.

The arguments for water diversion are based on reality. We are reminded that water supplies are not limitless. In the summer of 1977, there was not enough; the Lethbridge Irrigation District was required to restrict water use at the peak of the irrigation season because of a low stream flow from the Oldman River. Specialists point out the fact that stream flows vary and often the low period is when the water is most needed while millions of litres flow unused during early spring. Southern Alberta farmers and businessmen argue for diversion because production of more popular and therefore, more valuable crops could be grown which would bring more money into Alberta's economy. Also the farmers in the north have more water than they need; they try to remove water while we try to obtain it. Another argument is based on the fact that only a very small percentage of Alberta's water supply is presently available to more than 50% of the population who inhabit the southern or central parts of the province. Still another argument is that water diversion would be a major public works project creating many jobs for an extended period of time not only for construction but also maintenance.

The arguments of those people who argue against diversion are also well founded. To begin with, through the master agreement on apportionment between Alberta, Saskatchewan, and Manitoba, Alberta is able to use 50% of the water running through the South Saskatchewan River. In truth, we do not utilise all that we could by that agreement. These people say that the solution is to build off-stream storage areas to store all that is legally ours for use when required. Others ask for other alternatives to be researched as they find diversion too costly in monetary, social, and environmental terms (all of which will be discussed later). Better management of present supplies and upgrading to eliminate or reduce the waste through seepage, evaporation, spillage, etc., may be one solution. Some people argue that diversion is not necessary in Alberta because crops which require little or no irrigation can be used instead. Others believe salination is too serious. The people who argue against diversion cite many alternatives which will be discussed later. In the middle, we can look at both diversion and upgrading as well as alternatives to find an acceptable balance because we must use all available technology to conserve a most precious non-renewable resource - water.

"Ecological Implications of Water Diversion" – Gerrit Winkelaar

Water is an important part of any ecological system, and as such, great changes occur in the environment when large amounts of water are moved from one area to another. These changes would also occur if water was diverted from the north of Alberta to the south, and would constitute advantages and disadvantages for both areas.

Firstly, there are several advantages which would occur in the north of Alberta if water were removed from that area. The north has a great deal of water, so much so, that the excess water is considered a plague. It softens the ground, thus making construction difficult. Building is further hampered because the ground water level is so high that basements are often flooded. Furthermore, the excess water causes soil erosion. When water washes over land due to heavy rains or because of rivers over-flowing their banks, it carries parts of the soil away with it, stripping the land of precious topsoil. Also, water freezing in the soil during winter expands. When the spring thaw occurs, the water becomes liquid again and contracts. This seasonal expansion and contraction in the soil further washes away and breaks down the soil. Although a great many trees and plants grow in the north, they cannot reverse or hamper the erosion process because most of the erosion takes place on bare farmland. With the removal of this extra water, erosion is limited and floods are less frequent. A potential source of water for diversion are the northern flood areas. When these areas are drained, the shoreline is lowered greatly. Thus, because the water level does not fluctuate, it gives plants a chance to establish some permanence. Some vegetation which would take advantage of this situation would be grasses and rushes of various species. This increased vegetation would also provide benefits for waterfowl in the north. For example, it can be used as nest cover and can provide protection from bad weather for large animals. Futhermore, it provides quiet water for invertebrates, which constitute a major portion of the food chain and keep the water clean through their decomposition of wastes. The draining of excess water also destroys the breeding grounds of insects. There are a great many shallow pools and swamps which have been deemed suitable to drain in the north. It is in these pools that mosquitoes carrying diseases such as equine encephalitis, more commonly called sleeping sickness. The drainage would also provide greater land for farming. In addition, the now uncovered bottom of the swamp would provide very rich soil for growing crops. Another advantage resulting from the drainage of water out of the land in the north is that the water table would be lowered. The water table in the north is very close to the surface. This level does not

allow air to enter the soil, and therefore, the crops literally drown. Drainage would provide an area in which air can mix with the soil, thus allowing the crops to fully mature.

All the millions of litres of water which would leave the north would have to be sent to some area which could accommotate it. The very obvious destination of this water would be the south of Alberta. This area, especially the south-eastern sector of the province suffers from a fairly short wet season and an extremely hot dry season which lasts for most of the growing season. This corner of Alberta receives between 25 and 38 cm of precipitation a year in an area where most of Alberta's wheat is grown. So why grow grain where there is so little water? The flat prairies provides perfect growing land for crops. All which is needed is water - and that is where diversion plays its role. The excess water received by the south would be used primarily to irrigate the dry steppe lands. Thus, grain yields would be exceedingly higher, since every seed planted would fully mature instead of lying dried and limp halfway through the growing season. The increased amount of water would eventually drain into the southern river systems. Increased water in the waterways would stimulate growth along the rivers which, during the height of summer, is not remarkable at all. The diverted water would also raise the level of the water table under the prairies. Ideally, for farming the water table should 1.2 - 1.6 meters below the ground. This allows for maximum air intake by the roots as well as maximum water intake. At present, the water table in the south is far below this ideal level. Thus, crops must send their roots deeper to get water, which is very inefficient. A higher water table would mean better production, and it is certain that the water table would not rise to the point where it smothers the crops.

However, disadvantages also exist for both areas. In the north, one disadvantage would lie in the draining process. If the marshes and pools are improperly drained damaging erosion could occur, thus negating one reason for diverting water in the first place. Secondly, the marshes provide a habitat for various organisms including invertebrates as well as larger animals. When these marshes are drained however, the animals lose their habitat. In fact, Ducks Unlimited is attempting to preserve a great number of these marshes in order to protect the animals in these habitats.

There are also disadvantages in water diversion for the south. The extra water brought to the south brings more water-breeding insects, thus the mosquitoe problem experienced by the north would simply be

transferred to the south. The increased farm yields would provide food for a greater number of feeding insects. Thus, an increased amount of insecticide would be required to control the higher populations. This larger amount of poison could possibly find its way through the food chain. The further a substance travels up a food chain, the more concentrated it becomes. Thus, the insecticide could harm the people eating animals like wild ducks, which have eaten the grain. Furthermore, the food chains established in the now drained marshes would follow the water south, and re-establish themselves, thus increasing populations of animals again. These larger numbers would nourish themselves by eating the increased amount to grain growing on the prairie. The soil in the south contains many different salts, among them are sodium, sulphate, calcium sulphate, and magnesium sulphate. When a great deal more water than what the soil is used to is added, the soil reacts with the water, breaking down the soil and thus reducing good topsoil. Here lies another disadvantage. In addition, diverted water must travel about 1100 kilometers from the north to reach the south. As the water travels it becomes more saline. Thus by the time it reaches the south it has high concentrations of alkaline salts. When this water is used to irrigate these salts are absorbed by the land. This enhances the salt concentration of the soil, and further reactions between the soil and water would take place. Increased salt concentrations in the soil can create a veritable desert. This has become an increasingly large hazard in the State of California. Continued irrigation with salinated water has decreased growing conditions to such an extent that there is now a massive soil rejuvenation program underway in that state. It is hoped that this project will reverse the adverse effects of salinization on growing conditions. It is very possible that the California situation will be repeated in Alberta if water is diverted and transported improperly.

In conclusion, many advantages are evident in water diversion, but they are countered by several disadvantages. Should we exploit the habitats of animals to increase our farm productivity? Should we divert water to the south despite inevitable environmental damage or should we just leave the water where it is and make more efficient use of the good, rich farmland which is available to us. These are some of the overriding questions Albertans must face regarding ecological implications of water diversion before they can decide what to do about the issue.

"The Social and Cultural Aspects of Water Diversion" – Michelle La Brosse

Alberta has 8% of Canada's population but only 2.2% of its total freshwater area. There are about 1,600 lakes in the province, but only about 45 of them are easily accessible to the general public. In the southern and central regions of the province, where population concentrations are the highest, there are relatively few lakes.

The need for water for recreation in the south is great. In summer, when recreation demands are at their peak, water levels are at their lowest due to agricultural demands.

Opening up more water for recreation in the water-thirsty south is a challenge that has been picked up by regional and provincial authorities. A recently completed project in Fish Creek Provincial Park is a man-made swimming lake which draws water from groundwater wells in the area and channels the water back to the Bow River. This small lake is designed to fit into the natural surroundings and even boasts sandy beaches.

But opening up new water for recreation in the province is not the only challenge facing Albertans. In recent years there has also been a need for protecting and upgrading what limited water resources we already have.

The main concern is maintaining the levels of water available now. At Lac St. Cyr, near St. Paul, residents who use the lake as their major water supply as well as their main recreational outlet, became alarmed when water levels fell 2.7 m below normal. The people of the area were thrown into utter confusion. Water use was limited until the water levels returned to normal. This was achieved through water diverted from the North Saskatchewan River.

To better understand to social and cultural effects of water diversion we will look as some case studies.

<u>The Oldman River Basin</u>

The Oldman River rises from a lake on Lake Lyall in the Rocky Mountains and flows eastward through the foothills and plains before joining the South Saskatchewan River west of Medicine Hat. Over 125,000 people living in the basin depend on water in the Oldman River for municipal, industrial and recreational uses. These demands are growing to the point where unregulated flow, subject to wide seasonal

variations in flow, can no longer meet these needs.

The provincial government, recognizing the need for adequate water supplies to develop Alberta's water supplies, has placed a high priority on the use of water for irrigation in the Oldman River basin. Diversions in the basin were regarded as a viable means to achieve these ends.

The problems which resulted forced people to question to benefits of diversion.

In the summer of 1977 river flow was so low that the Lethbridge Northern Irrigation District had its water cut off during peak use season for ten days. While most field crops were not affected by this reduction, farmers growing peas and potatoes incurred severe losses.

Spring floods caused considerable damage. In June, 1975, floods in the basin caused $2.5 million damage.

River bank erosion was a serious, on-going problem.

The Peace-Athabasca Delta

The Peace-Athabasca Delta is one of the world's largest freshwater deltas. Located in north eastern Alberta at the confluence of the Peace and Athabasca Rivers, this 1.5 million acre wetland provides breeding grounds for ducks, geese, swans, and whooping cranes and critical habitat for moose, bison, muskrats and other fur brearing animals. The wetlands are maintained by periodic flooding by the Peace and Athabasca Rivers.

The construction of the Bennet Dam on the Peace River in British Columbia in 1968 changed the flow of the River. The dam held back spring runoff and prevented flooding of the delta. The levels in Lake Athabasca fell and stayed low.

With decreasing level of water many problems confronted the people and wildlife who depend on the delta. Waterfowl nesting habitat declined. Muskrat habitat declined. Fish spawning grounds decreased. Grazing habitat for moose and bison declined. Navigation on the Slave River was affected by low water levels, and low water prevented supply barges from landing. Native trappers, hunters, and fishermen lost their livelihood.

It is not possible to mention all of the people whose lives would be forever changed due to water diversion for both good and bad. There are the farmers whose livelihood could possibly be changed due to water diversion dividing his land; not to mention what such a division could do to a small town. We must ask ourselves the question: "Do the positive social changes caused by water diversion outweigh the problems caused by it?"

"Economic Condiderations of Water Diversion –" Craig Buchholz

The South Saskatchewan River basin has 13 million acres of Alberta's land and 3% of its water. This 3% is used to irrigate 1 million acres of land in Southern Alberta, the largest such region in Canada. Even at its full potential only 2 1/2 million acres could be irrigated with the present amount of available water.

However, a further 6 million acres could be irrigated if water was available. The diversion of just 18 million acre feet, approximately 25% of north flowing water would be needed to irrigate this land. This newly irrigated land would become very fertile, producing 18 different crops instead of the present seven. Crop yields would rise four fold in grains and five to seven times on other crops. In fact, the 3.6% of Alberta's cultivated land which is irrigated produced 20% of the province's total crop worth in 1973. In the north proper drainage and diversion would increase cultivated land from its present 4 million acres to 20 million acres.

The proposed diversion scheme would divert north flowing water into Lesser Slave Lake, then south to a reservoir north of Edmonton, and then southward to the South Saskatchewan River using rivers, dams and diversion channels. Total estimated cost in 1980 for this project was $8.1 billion. Annual maintenance and operations costs are estimated at $563 million. The life span of the project is expected to be 100 years.

In conclusion, the diversion scheme would provide employment, recreation, water power, and irrigation water. Return on agricultural production would increase from the present $46 per acre on dryland to $181 per acre on irrigated land. This represents a total increase over the 6 million acres of $810 million annually. This represents 54% of Alberta's total crop worth. Over the 100 year life of the project this will produce $81 billion worth of crops. For the same period capital and maintenance and operations costs total $64.4 billion. Thus, the difference between expenditures and expected returns is $16.6 billion over the 100 year period. This amounts to $26.6 per acre per year.

"Political Considerations of Water Diversion" – Leela John

Canadians are only now realizing that water is the most important resource of the 80's.

On the Prairies, concern is being raised that our present supply of water may not be sufficient to supply our future needs.

The West is clearly headed for a conflict over water and the federal and provincial governments show few signs of planning ahead to prevent strife.

Water does not respect political boundaries. It crosses borders and forces us to think beyond both region and nation to consider the whole continent.

The issue of water diversion splits Alberta politics sharply on a north–south line.

The south is thirsty, but the north is awash. Eleven years after pledging to make water an asset for all, the Conservatives have yet to find a way of bringing the two regions together.

Even Premier Lougheed reported to the legislature in 1981 that cabinet divisions were so strong that there was little hope of reaching a clear "long–term policy" on water diversion.

The Tory platform in 1971 called water "perhaps our most valuable asset" and raised prospects of a "well considered, long–term policy for the first time in Alberta's history." However, the Conservatives shelved the Prairie River Improvement, Management, and Evaluation (PRIME) study started by the former Social Credit government. There would be no future consideration of interbasin water transfer until all water supplies had been fully allocated within each basin. Neither the PRIME proposal or the Saskatchewan–Nelson Basin Board study are available from the government today.

The Dickson Dam on the Red Deer River near Innisfail was launched over the angry protests of environmental groups and local farmers in 1979. Critics of the project saw the dam as a stepping stone towards inter–basin water transfer.

The province's oldest and biggest conservation organization, the Alberta Fish and Game Association, has registered a strong protest

against diversion works unless they all proved to be needed and safe.

The province has plenty of water. It is just that 87% of it goes to the Arctic Ocean "virtually unused" via the Peace, Athabasca, and Slave River systems.

The suggested solution for the problem led straight to the legislative row over "inter-basin transfer of water" from the Peace-Athabasca-Slave system. This would be an undertaking like the PRIME scheme.

The government's plans to build a $200 million dam on the Oldman river indicates that industry and eventually, export to the U.S. are the real issues, because irrigation for southern Alberta is "low on the list of provincial priorities," according to the Peigan Indian band living at Brockett on the Oldman River.

This terrifies environmentalists and northerners who regard their water as a natural inheritance.

Unfortunately, suspician persisted, due to the fact that in 1981 a series of memos leaked to the press, sharing the information that the premier himself favours water diversion.

One memo called for a $5 billion project to transfer water from the Peace River basin to the parched southland.

Premiere Lougheed, aware of the sensitivity of the issue, is perhaps now looking at the alternatives. Or perhaps water diversion has simply gone underground again, as it did a decade ago after the Social Credit government took it into the election campaign that ended 36 years of Socred rule. The premier, according to secret documents leaked to the NDP, was recently musing about how to sell Albertans on a multi-billion dollar project to direct northern rivers to meet southern needs, without precisely mentioning water diversion.

At first, the premier denied to the legislature that his government was considering water transfer.

A memo outlined what the government perceived as the main stumbling block: "public confusion through the media" if news of the diversions leaked out. "You will recall that the premier emphasized the importance of public relations aspects and noted that a public demand for water resources development must be created" the memo stated. "When the studies are announced the announcement must focus on those studies

and not on water diversion. This will allow two full years of public relations activities to develop furthur acceptance by the public toward diversion and water development." The premier saved himself from a charge of having lied to the legislature by announcing that the cabinet had voted down the water diversion scheme three days before Grant Notley made it public. Notley, however, points out that the Conservatives have consistently denied that dams under construction are part of an interbasin transfer scheme, but the documents made it clear that the dams are precisely where they are needed for transfers. The estimated cost was $15 billion which would bankrupt Alberta unless the government was considering exporting water to the U.S., in which case the whole scheme makes sense. There are signs of public concern over whether residential water should be metered in Calgary. (Edmonton, with meters uses 30% less water). This is a reassuring defence against American demands on Canada for water.

On the growing world crisis in food, as demand soars above supply, those awful pictures of gaunt, emaciated children will become more familiar. It will be an irony if the one political party in Alberta that most prevented us from feeding the starving masses was none other than the NDP. It was they who sought to scrap the scheme whatever the consequences to the masses it might have fed.

Even the efficient use of water instigated by water pricing and scientific braakthroughs will not ensure adequate future water supplies. It is also essential for policymakers on both the provincial and federal levels to work together with the public to achieve an intergovernmental policy on Western Canadian water policy, backed by tough legislation empowered to enforce these policies.

In Ottawa, powerful voices are being raised in praise of the $100 billion GRAND (Great Recycling and Northern Development) Canal. The scheme's backers claim that the plan would not actually divert Canadian water, since only recycled water would be exported to the United States, freshwater otherwise lost into Hudson Bay. The idea is actually feasible and would purify the Great Lakes as well as providing an enormous water surplus we could sell to the Americans without hurting Canada.

The value of water is a difficult concept because it has been cheap to obtain and often considered, like the air we breath, to be a free good, a necessary item which is not for sale.

Water, which has occupied a relatively low priority in the public and

political consciousness, is about to become one the major resource issues of this region. Will we have the knowledge and the judgement to sift the alternatives and make the decisions which will assure that water is a well-used and effective servant in the development of the west and the north?

It is important a firm policy supported by both the federal and provincial governments be adopted to deal with future water export proposals and interbasin transfers which will affect more than one jurisdiction.

"Alternatives to Water Diversion" – Todd Gehring

Drought has a cruel way of bringing home the importance of water. It's not that southeastern farmers need to be reminded. They already know the value of the precious liquid, especially farmers who looked out helplessly last summer at their withered crops and their livelihood vanish from their very eyes. But for city folk who take for granted the stuff produced by a twist of the tap, last year's drought in southern Alberta is a disheartening reminder of how much everyone depends on water. Most of us, although we might suffer steak-and-ice-cream hallucinations, could go without food for a week or two. But take away our water for a mere fraction of the time, and none of us would survive. If the cold and heartless Albertans to the north will not allow diversion projects to the equal citizens of the south, then what are some of the alternatives that can be utilized in that we too may have an adequate supply of fresh water?

There have already been numerous Federal-Provincial studies making an abyss of recommendations. These alternatives could be broadly grouped as economic, technological, and social approaches to the supply of water and energy. One recommendation, sure to upset this provincial government that jealously guards its jursidiction over water, is that Ottawa take a more direct role in managing water resources in Alberta and other provinces. Another way is that water consumers, especially farmers, pay much more for the water they use. But will these underhanded suggestions really make that much of a difference? Then we come to waste. Waste is rampant in almost every use to which water is put. We know that without at least certain minimum quantities of water life is impossible, but because it is so cheap, the consumer places little value on it, and waste in urban water systems, industry, and in irrigated agriculture is enormous. Strangely, the common toilet still uses up to 6 gallons per flush, when 2 should surely be able to do with a common device that, with better design, could save enormous quantities of water. A great amount of water is rendered useless through pollution each year. Where pollution is concerned, we have done a remarkably thorough job in this area, considering the sparse population of the province. Large bodies of water have been rendered incapable of supporting their normal quota of uses. We have poured sewage, salt, and deadly chemicals into any water that was handy. This was done evidently on the clear understanding that the water – the abundant, forgiving, water – would dissolve, disperse and generally hide anything dumped into it. This pollution poses a direct threat to our drinking water, leaving other uses of water such as for irrigation impossible. Just remember this; the next time you go

Calgary, a city with an abundant supply of water, any yet dumps 2,000 kilograms of the nutrient phosphorus into the Bow River every day of the year. A report from Alberta Environment points out that Calgary is responsible for a substantial portion of the weed-producing nutrient going into the South saskatchewan River - the major water supplier to the south. Does this city have a right to destroy the water used by us and then not replace it because it is opposed to water diversion?

Industries of all kinds use water and wildly varying rates. Requirements in the production of a pound of artificial rubber range from 13 gallons to 300 gallons of water. Similar comparisons can be made between efficient and wasteful pulp mills or between aluminum smelters where water requirments for a pound of aluminum range from 1.23 gallons to over 36 gallons, or oil refineries which may use as little as 1.73 gallons of water to refine a gallon of crude petroleum, while others consume as much as 44.5 gallons of water. Clearly there exists enormous opportunities to use water more efficiently in industry.

In agriculture, the nature of the use of water is such that the percentage of it that can be saved through avoiding waste is less that that we have noted in other industries. Yet because farming absorbs 90% or more of the water that is used, any savings through increased efficiency of water use are enormously important in absolute terms. It is estimated that the dryland farmer of the west loses twice as much water in evaporation to the air is is taken from streams, wells and springs for distribution to all the public waterworks in the United States.

Another alternative is to place a fee for the consumption of water. With the introduction of realistic pricing for water and energy, a great many alternatives to water development projects will receive the attention they deserve. First, it can be expected that requirements will be reduced in domestic, industrial, and agricultural uses as waste is reduced, and more efficient use made of water and energy. Homeowners will repair leaky taps and toilets, and water lawns more judiciously. Industries will concentrate on proven and innovative methods of recycling water, rather than paying for the much larger quantities involved in "once through" systems. Irrigation will tend to be used for high value crops, with the grains and forages that are dependent upon artificially low water prices being reduced in acreage, making water available for users who can pay for it.

Let us assume that water is being priced in accordance with the real

costs of delivering it to the user and is therefore being used reasonably effeciently. Let us assume further that the objectives for which water development is being suggested, have been carefully assessed and that additional water supplies are likely to be beneficial, We are still far from the point at which the importation of water is a logical step. It is necessary to examine with much more care the use being made of the water available locally. As a homeowner and water user there are many things that the average citizen can do as well to provide alternatives to the need for water diversion. Such alternatives as placing a plastic water bottle filled with water in the toilet weighted with small stones. This will reduce the amount of water used to flush – about 24 litres in a conventional toilet. We could also use water-saving toilets which only use 14 litres. Turning off the shower taps while soaping and shampooing, a short shower uses less water than a full bath tub will also save. Don't run the taps needlessly, instead keep cold water in the refrigerator which eliminates the need for running tap water until it feels cold. Repair leaky taps and toilets. Modified shower heads are available which also reduce the flow of water from the normal 24 litres per minute to as low as 10 litres per minute. Again, have people use metered water where they must pay for what they use. Paying for the amount of water used encourages savings. There are also ideas about recycling water after is has been used and using waste-water from larger municipalities for irrigation. One can remember this rule when flushing the toilet: "If it is yellow, let it mellow, but if its brown, flush it down."

But I ask you, why should we conserve water to such an extent and achieve no substantial results? Farmers in the Peace River Country of northern Alberta battle the problem of drainage, ridding their lands of unwanted water with a minimum of soil erosion. Their southern counterparts however, struggle to bring water to their lands. Is all that hoarding worth it?

When all the economic, institutional, and physical alternatives to great water developments have been considered and applied where possible, whether for water supply or for energy, there will still be pressures for the manipulation of our water resources on a grand scale it present trends continue. This brings us face to face with the real alternative to the endless development, whether of water or of other resouces. Recognition that the world and its resources provide a finite home for man and the other memebers of the biosphere; that there are limits to the growth that can occur in a given space; and the exhaustion of some resources and destruction of most of them is a

very real possibility is difficult for a society whose institutions are largly based upon the assumption that endless growth is possible and desirable. Recognition of constraints within which man must live is foreign to the thinking of many North Americans, yet clearly we must sooner or later face the realities – we all must share the earth's resources equally that includes most of all water.

HARRY COLLINGE HIGH SCHOOL - HINTON, ALBERTA

"Is natural resource extraction compatible with Wilmore Wilderness Park?"

Representing fish and wildlife interest group - Darren Armstrong

The greatest concern of Fish and Wildlife is that the Wilmore Wilderness Park should be limited to hunting. Hunting, as well, should be limited to ensure growth of the game population.

First of all, hunting seasons are much too long and the animal population doesn't have a chance tomaintain its numbers. Too may big game hunters are brought in by guides and outfitters and the animals and fish are nearly wiped out.

Even though hunting should be limited, wilderness parks were made in the province of Alberta for the purpose of eliminating vehicle traffic, because of game harrassment. There has been far too many people coming into the park on camera tours, on horseback, on foot, and on bikes. Ever since the park was created it has strayed from the purpose of sport hunting by at least 50%.

Secondly, so much animal harrassment has forced the game out of the park. Large game used to be seen in groups of hundreds, now is is difficult to find the animals in groups over five. Since so many game have left the park, vegetation eaten by game has grown beyond normal browsing height. And because its our policy to extinguish fires, this overgrowth continues. Unless animal harrassement ceases, vegetation will remain at an unusual height.

Third, if a mine is put in place, it will cause destructive erosion to the park. In time silt will build up in the local rivers and creeks and destroy what's left of spawning grounds for fish. Along with loss of spawning grounds the water quality will be extremely poor from a build-up of coal sediment. Once the ground surface has been scarred it takes a good many years to heal these scars because of the high altitudes and cold temperatures.

Fourth, guides and outfitters bringing tourists into the park have caused a problem. Horses come into the park and then are left to graze off the food meant for park game. Besides this, trees are girdled - stripped of their bark - then these trees are left to die and then are used for firewood later. After some time campsites

become eyesores.

Fifth, an open mine would certainly mean an open and fully accessible park. Currently, garbage is a serious problem in the park it has been buldozed under or airlifted out in large amounts. If the park was to be opened, this problem would be greatly magnified. Hunting would very possibly become restricted, which would defeat the original purpose of the park.

It is the position ofthe Alberta Fish and Wildlife department to keep the park as a wildlife park, restricted to sport hunting only. This would prevent animal harrassment, vegetation overgrowth, erosion, lack of food for game, and a garbage problem.

Representing the political view - Charlene Town

The government has tried its best to satisfy all the people involved in the Wilmore Wilderness Park. The following Acts and bills show the effort the government has put into doing what the voters want:

Wilmore Wilderness Park Act - 1970
Wilderness Areas Act - 1971
Clean Air Act - 1971
Clean Water Act - 1971
Wildlife act - 1970
Bill 204 - 1979
Bill 222 - 1979
Eastern Slopes Policy (Revised 1984)
Planning Act - 1977

All of these policies can be changed because any government policies are not etched in stone. A policy determined in 1965 is not necessarily valid in 1985.

The intent of Wilmore Wilderness Park is to protect wildlands, wildlife, and to provide Albertans with a unique mountain region in which to practice the arts of primitive travel. There is plenty of mountain scenery already available to motorists in other parts of Alberta, yet there is precious little true wilderness left - the kind that requires the terrible sacrifice of actually having to walk rather than drive.

At this time the only committment is to study the possibilities that exist in the park. It is premature to assume that development proposals will result from the study or that they would involve substantial change in use of the park or detract from its natural beauty.

In 1978, Mr. Adair, then Minister of Recreation, Parks and Wildlife wrote:

> While I share your concern that there be areas set aside in their wilderness state and left for future generations, I also believe it is possible to create a balance between such areas and the careful development of recreation opportunities available to all citizens, not just those who have the mental and physical capacity to make use of wildlands. (letter to Ms. D. Haukedae, November 24, 1978)

The Eastern Slopes Policy does just that.

It is clear from the content of the Act that the park was never intended to be an inviolate wilderness area. Amendment of use priorities by Order-in-Council is entirely consistent with the Act, so long as the natural beauty of the park is protected.

The argument that our wildlands have to be gutted with roads in order to open them to the physically and mentally unfortunate makes about as much sense as lowering the level of university courses so six year olds can pass them.

In closing, I would like to say that the intent of the Willmore Wilderness Park was for the enjoyment of all Albertans. And Wilmore Wilderness Park is a wilderness Park, but is so at the will of the people.

Representing mining interests – Leslie Schaupmeyer

In 1959 Wilmore Wilderness Park had an area of 2,149 square miles. Since then is has undergone two reductions and is now 1,775 square miles. I propose a reduction of a mere 13 square miles to permit resource extraction – in particular coal mining.

Of special interest is the Luscar Formation which contains a number of coal seams. This coal bearing formation extends westward into the Front Ranges with exposures along the Hoff, Berlund, and Persimmon Ranges.

Coal leases cover only a small area of the eastern Wilmore Wilderness Park.

A major problem in placing a mine in the area is that this area contains appormimately 25% of Wilmore's mountain goats, which is 10% to 12% of the province's goat population. If a mine was to placed in this area the goats would have to be relocated to another part of the park.

This area contains 1.6 billion tons of coal of which 6.5% is recoverable at the present time. Most coal mines extract 2 million tons of coal a year or about 5,500 tons a day. At an estimated $76 per ton, the total value of the project would be 7.6 billion dollars, or $152 million per year.

Total costs over the fifty-year life of the project would be:

$235 million to upgrade railway,
$ 95 million to transport workers to mine,
$ 93 million for road work,
$ 53 million to provide the area with electricity,
$700 million to open the mine and provide equipment,
$821 million for wages
$100 million loss from railway operations

Total outflow is $2.1 billion, leaving a profit of $5.5 billion.

A mining operation of this magnitude would create 5,000 new jobs. Over half the pesent population of Hinton (9,000). Hinton would become a boom town once again, rising the population as high as 25,000 within a few years. Merchants would have increased sales and they would need extra help to handle the people. Again, more jobs.

On the subject of reclaimation people are concerned with the looks of the land after a major mine has been in the area.

Nowadays a mining company cannot so much as pluck a blade of grass without a reclaimation plan. When a mine has finished in a certain area, the area must be restored to what it was previously. If it was a desert, it must be restored to a desert. If is was a tropical jungle, then it must be restored to a tropical jungle. Wildlife is brought back to inhabit the area and the land must be the same level as when it was before it was mined.

The rules are much tougher now that they were a few years ago. As our natural resources are quickly depleting, sooner or later we will have to go in and get the oil, gas, and coal. Why not sooner?

Representing forestry interests – Irene Proulx

Wilmore Wilderness Park has been a park since 1959; however, the provincial government in 1912 hired someome to look after the Rock Lake and Grande Cache Area. During the period between 1940 and 1945 this road was used for logging to bring out the logs for a lumber company. This road is still used by people packing in either on horse or on foot.

Wilmore Wilderness Park has the quality of conifers that we need. They are four types: lodgepole pine, white spruce, black spruce and alpine fir. About 5% of Wilmore's trees are recoverable in the lower eastern sector.

I propose the installation of a small forestry company. This company would provide 15 to 20 jobs and give more business to the community of Hinton. If a mine were to be placed in this area, the forestry company could clear the trees and make way for the mine. Later when the mine was finished in a certain area, the forestry company could plant trees for the reclamation and regeneration of the site.

A major forestry industry like St. Regis could not survive on the profits made because of the slopes and high elevation of Wilmore.

The park has a major overgrowth problem. With the overgrowth comes disease killing off a great number of trees. This also happens when a tree ages. If this continues St. Regis will have to go in and take out the trees which are no longer useful.

In 1930, a fire destroyed a major forest area around Rock Lake. The trees have grown back by natural regeneration.

Representing the Alberta Wilderness Association – Kelly Robson

My main concern is preserving the aesthetic beauty of the park and to preserve the area for future generations. The current policy to preserve Wilmore Wilderness Park for non-motorized traffic only is very effective in keeping man-made damage to the wilderness to a minimum. Although we, on our hiking trip, found quite a bit of garbage half-buried and strewn about by careless hikers, riders, and mountain bikers, it is easy to imagine the increase in garbage if the park were made accessible to motorbikes and four-wheel drivers.

Our trip took place along the Wild Hay River, an area easily accessible to novice hikers like ourselves and a favourite area for one day trips. This the area that is proposed for mining. Although the area is only 13 square miles, its value is inexpressible, not only because of its beauty, with its clear mountain streams, boreal forest, snowy peaks, and mountain meadows, but because of the fact it is the only gateway to the park in the Hinton area.

The Wild Hay River is right in the middle of the proposed mining area. Excess pollution would be caused by mining, wrecking the river ecosystem and ultimately adding to the pollution in the Athabasca River, which the Wild Hay feeds into.

Overgrowth is a problem in the park especially in low wet valleys. Willows that normally grow only a few feet tall have grown to heights of over six feet because of overhunting. There are too few animals, especially moose and caribou to keep the vegetation down. Overgrowth turns grazing lands into swamps. Fires in the area are quickly put out, thus there are no areas cleared to provide new growth.

Overgrazing of the meadows is a valid concern. Better management by the Alberta Forest Service can correct it.

We cannot limit activities in the park to hunting only. It is land that belongs to all Canadians.

In summary, leave Wilmore Wilderness Park as it is. Better management by the Alberta Forest Service with input from various interest groups will reduce the problems.

UNIVERSITY OF ALBERTA
FACULTY OF EDUCATION

Air Quality in the Edmonton Area

Group Members: Deborah Frigon
Margaret Horton
Bill Romanchuk
Daryl Chichak

We contacted various people in industry, government, and environmental associations, as well as experts in the fields of air quality and acid rain for background information for our presentation.

1. Air Quality in the Edmonton Area

For some time, there has been government and public concerns regarding air quality in the Edmonton area. In 1976, the Association developed a comprehensive and sophisticated air quality monitoring network with the following objectives:

- collect data and determine trends in air quality
- determine effectiveness of industry air pollution control
- provide data for future environmental studies.

The network was completely funded and operated by the Strathcona Industrial Association.

In 1982, the network was converted to the Compliance Network:

- the compliance network is unique in Canada

- industry uses the network to meet government regulations under the Clean Air Act

- government has instantaneous access to air quality data, and

- government can access historical air quality data to assess air quality trends or pollution episodes.

Throughout the development, there was close liaison between technical representatives of industry and government to ensure sound technical development of this unique compliance network.

The Strathcona Industrial Association is an Association of nine companies operating along "Refinery Row" and the adjacent area in nearby east Edmonton and the County of Strathcona. Member companies play a significant role in municipal, porvincial, and national economies. The members are:

Alcan Smelters and Chemical Limited
Celanese Canada Inc.
C.I.L. Inc.
Esso Petroleum (Canada), Ltd.
Fiberglas Canada Ltd.
Gulf Canada Ltd.
Interprovincial Pipe Line Ttd.
Stelco Inc.
Turbo refineries Ltd.

Many of their products are used by all of us in our daily lives. Examples are gasoline and diesel fuel, other examples are chemical building blocks for plastics in automobiles and household goods to name a few.

The principal focus of the association is environmental pollution control such as in the air quality monitoring system that is used by government and industry to monitor and assess air quality in the Edmonton area.

The compliance network monitors major pollutants in the air such as:

- hydrogen sulphide
- oxides of nitrogen
- total hydorcarbons
- sulphur dioxide
- total suspended particulates (dust particles)

Wind speed and direction is also monitored.

The six monitoring stations surround the industrial area and four are located in the adjacent residential areas of Beverly, Gold Bar, Clareview, and Sherwood Park.

The latest in computer technology is used:

- air quality data are transmitted to a central computer every 30 seconds

- 5 minute average values and one hour average values of all pollutants are calculated and stored in the central computer

- average values are automatically checked against government regulation limits

- and "out of compliance" situations result in the automatic generation of reports that are accessible to government and industry

- comprehensive daily air quality reports and monthly reports are automatically generated.

The air monitoring stations completely surround the industrial areas within which the members of the association are located. Stations are located on both sides of the North Saskatchewan River.

These six stations were strategically located to take account of:

- prevailing wind direction
- major industrial locations
- local residential areas.

Thus, air quality is measured both in industrial areas and in the nearby residential areas.

Alberta Environment has an extensive urban air qualty monitoring program (S.I.A.), as well as a rural industrial monitoring program. In Edmonton, there are six permanent continuous monitoring stations, one portable continuous monitoring station, and 24 exposure sites for total sulphation and dustfall, 7 sites for soiling index (haze) and 4 sites for total suspended particulates.

The government has used current and historical air quality data from the compliance network to assess and alleviate any air quality concerns that arise. A good example is the sour gas well blow-out at Lodgepole.

Very specific conclusions can be drawn regarding air quality in the industrial area and the surrounding residential areas:

1. Effective continuous monitoring system with data quality assurance program which periodically checks data collection equipment by random comparison tests.

2. Stric emission standards (maximum desirable).

3. Recovery rates close to 98% due to use of best possible technology.

The compliance network has a number of major uses in addition to monitoring the envrionment:

- air quality data and meteorological information if there were a spill or fire.

- public education in air quality and industrial activity

- education in the schools, enabling students to obtain a greater understanding of the environment.

The development of this unique compliance network shows that industry and government can work together towards a common goal in the protection of the environment.

2. Is the Monitoring System Effective?

The location of air quality monitoring stations was based on studies which took into account several unique local factors, including prevailing winds, thermal circulation, type of inversion stack (height), population and industrial distributions. In addition the the 6 premanent stations, 2 portable stations are at the disposal of an independent consultant which can be operated at anytime at any location for informal spot checks or during a period of unique meteorological phenomena or during spills and breakdowns.

The system is based on the policy of Best Possible Technology (BTP), and also eliminated the redundancy of each plant implementing its own system and deluging the provincial government with mountains of duplicate paperwork.

3. Recommendations

We have no reason to question the intentions or the sincerity of industry or civil servants in maintaining the highest possible emission standards. Yet, it is difficult for the public to determine whether or not the emission standards are being properly enforced.

The Clean Air Act identified three levels of air quality:

1. Maximum desirable: the long term goal for air quality, providing a basis for an anti-degradation policy for the unpolluted parts of the country and the continuing development of control technology.

2. Maximum acceptable: provides adequate protection against adverse environmental effects.

3. Maximum tolerable: denoting concentrations which need reduction right away.

The Alberta Environment and Energy Resources Conservation Board has adopted the most stringent air quality standards (maximum desirable) for some pollutants. For example, a plant must emit no more that 0.17 parts per million of sulphur dioxide over a one hour period. In Ontario the limit is 0.25 ppm and in Manitoba the limit is 0.34 ppm.

In general, Alberta has adopted as its standards/objetives the federal maximum desirable levels, except in a few instances in which the acceptable level has been adopted. As a result, Alberta has some of the most stringent standards in the world.

We agree with the report "Still Waters" (1981) by the Feberal Sub-Committee on Acid Rain, which states "we have no wish to make recommendations that will disrupt or unduly delay the development of Alberta's economy, nevertheless, we are convinced that it is essential to pursue industrial development utilizing the best avaiable emission control technologies." For example, the Stathcona Industrial Association air quality monitoring system. We furthur suggest that other large industrial communities implement a similar compliance network.

We wish to thank all the government agencies, industrial organizations, environmental groups, and individuals for their co-operation and support. A special thanks to Mr. Rob Lee for sponsoring our presentation. An extra special thanks to Dr. Wallis Samiroden for his resources, guidance and moral support.

ALBERTA 4-H PRESENTATION

Should agricultural practise be changed in relation to how the soil is cultivated and its quality impinged?

Group Members: Delin Sheehan
Dillis Soetaert

(This presentation has been edited to aid in understanding without the slides and overheads.)

In order to determine if our present agricultural practices of cultivation should be modified we must first look at the soil and the effects these practices have on its quality.

Soil is a naturally occuring substance made up of minerals and organic matter with pore spaces occupied by water and air.

In Alberta there a are approximately 810 different soil types, each requiring specific management practices.

Soil is the foundation on which our life is sustained as it is a source of food, clothing, and shelter both directly and indirectly. "Mining the soil" is in effect what the practices of agriculture is doing. Each time a crop is sown and harvested, nitrogen, potassium, sulphur, and phosphorus are being taken from the soil. Revoval of minerals in this fashion is thus defined as mining the soil.

Here is a poem about mining the soil that may help clarify what our presentation deals with:

Angel's Soliloquy

I did right well with my earth's bounty
Held fat notes on half the county
Made big crops and lots of dough
Couldn't bring it with me though.

Grandson, now, works twice as hard
But gets low yields for his reward
He'd make out better, I've no doubt
Had I put in what I took out.

Canada, being the second largest country in the world, is often

assumed to have great potential for agricultural land. However, because of our colder climate almost one half of Canada is totally unsitable for agriculture. A further 28% is covered with rocks and extremely dry soil. In all, less than 9% of Canada's land mass is suitable for cultivation and presently only 4.5% is cropped. These figures clearly indicated why soil conservation is so essential today.

Evolution of the first system of soil management, the wheat-fallow rotation, began on the prairies in 1812 and followed a general pattern:

1. Spring tillage to prepare a seedbed.
2. Surface compaction after seeding.
3. Threshing at harvest, followed by more tillage or burning to eliminate crop residue.

Early farmers soon discovered that a good seedbed was also a good weedbed, and thus, began to till more for weed control. Summerfallow was thus adopted to store moisture in the soil, mineralize nitrogen from soil organic matter and to control weeds and disease.

After nearly 200 years of this general pattern of cultivation on the western prairies, our present society now faces the threatening aspect of soil degradation. Is it time we change our traditional methods? If we continue to practise these methods how soon will our soil be destroyed? How long can we expect improved technology to mask the problem of soil degradation?

The most severe type of soil material loss is in the form of erosion. Water erosion affects northern areas while wind erosion affects central southern and eastern areas of Alberta. Man helps to cause wind erosion by using the summerfallow crop system, planting row crops such as corn, potatoes, sugar beets and by reducing crop residues by burning the stubble. These factors lead to poor root development which reduces the water-holding capacity of the soil. Therefore the tillage related moisture loss increases the susceptability of the soil to wind erosion.

The cost of wind erosion to the farmer can be assessed in two direct ways:

1. Costs based on the replacement value of the nutrient loss, in the form of chemical fertilizer and anhydrous ammonia.

2. The lost productivity which is due to reduced topsoil levels.

Wind erosion may be kept to a minimum by maintaining vegetative residue cover and maintaining the optimum clodiness of the earth. Vegetative cover and crop residues are very important for the protection from both wind and water erosion. These two combined have been known to offset the effects of climate, topography, and soil types on erosion.

It is important to remember that each field presents a unique situation. Just like people no two field conditions are alike. These differences greatly affect the types and amount of residue and vegetation to effectively protect from wind and water erosion. The quality of crop residue to prevent erosion is dependent upon the climate, soil types, and unsheltered distances in the field. The effectiveness of vegetative cover is dependent on the bushiness, height, and orientation in relation to the prevailing winds, (trees should be perpendicuair to the prevailing winds.)

Water erosion occurs in nature on sloping lands when the velocity of precipitation, whether rain, snow or man-made irrigation, exceeds the capacity of the soil to absorb it, thus creating run-off. However, man can be more cruel than nature. Certain agricultural practices have been known to increase the severity of water erosion problems. Practices such as row crops (corn, potatoes, sugar beets) which serve little protection from the rain, widely spaced plants produce little resistance to the run-off, small grains (canola) provide some protection while summerfallow provides no protection. Natural prairie and grasslands and legumes give a high degree of protection and improve soil structure.

Water erosion hazards to avoid include: stubble removal, summerfallow, and lack of a suitable crop rotation system. All these factors help raise the hazard level from low to moderate risk under natural conditions. Rainfall intensity causes the water erosion that revoves nutrients - the fine-grained soil particles and organic matter which is needed to support crop growth. The adverse effects of tillage on soil moisture and structure leave summerfallow soils more susceptable to wind and water erosion that cropped land or undisturbed prairie.

Physical deterioration of soil includes the breakdown of organic matter and the loss of nutrients. Organic matter is the fraction of the soil which includes plant and animal residues. Organic matter

maintains the optimum soil structure by creating nutrient reserves and acting as a chemical buffer.

Destroying the organic matter is a by-product mining the soil over a short period and then abandoning it. The significant contributor to loss of organic matter is excessive tillage, because it favours the physical loss from erosion and the increased rate of oxidation.

Plants grow in soil and use nutrients held in the organic matter. Plants die, decay and help renew organic matter in the soil. However, when soils are cleared, ploughed, and tilled, they lose organic material over time and upset the natural balance.

Common causes of organic matter loss include:

1. excessive tillage
2. summerfallow
3. insufficient use of legume or forage crop rotations
4. burning crop residues
5. wind and water erosion

Under these conditions organic matter is broken down faster than it is replaced. Prairie soils have lost between 40% and 50% of the original content of organic matter since cultivation began around the turn of the century. This means that the source of nitrogen, micronutrients, moisture retention, and overall soil productivity have been reduced.

Soil nitrogen comes from two main sources:

1. natural release from oxidation of humus
2. man-made release through residues, anhydrous ammonia, and chemical fertilizers.

Erosion and tillage have reduced the output of nitrogen from humus. Cropping patterns are partially responsible for the decline of nitrogen, nutrients, and organic matter. Native grassland returns a higher percentage of plant matter than the fallow year of a wheat-fallow cycle. Hoescht Company has stated "Summerfallowing is, in essence, a mining operation which causes the breakdown of organic matter and the release of nitrogen. It leaves no source and no opportunity for replenishment." Summerfallow is considered to be the most unnatural state land can be placed in and supports no vegetation and exists nowhere in nature except deserts.

In 1981, the Environment Council of Alberta surveyed farmers asking them why do you summerfallow? Ninety percent of the farmers believed summerfallow was necsessary for weed control and moisture conservation. This survey shows the discrepency between popular farming beliefs and scientific research regarding summerfallow and intensive tillage. There is an extreme need for more communication between the researchers and the farmers.

Now that we have gained an understanding of soil degradation and realize the seriousness of this problem, it is time to look towards the future and possible solutions and alternatives.

Canada is fortunate in that other countries come upon this problem twenty or thirty years ago, and thus, have already developed som techniques that we can benefit from.

Possible conservation suggestions for retaining organic matter include crop rotation which are the the use of grass and legumes. These rotations add large quantities of organic matter to the soil, and reduces salinity and erosion problems. However, the negative aspects of crop rotation are a fluctuating market, the problem of having to ship the crop elsewhere. Another problem is that in dryland brown soil zones, with no available irrigation, there are problems with germination. Also special equipment may have to be purchased to reap the benefits of the crop.

A second alternative to the traditional practice of wheat-fallow is continuous cropping. This keeps higher levels of soil organic matter but can take five years before a noticeable difference is observed. Can you imagine five years with little or no return income? Continuous croppong requires an increase in fertilizers and herbicides, which is a further cost that the farmer often cannot feasibly afford.

A third alternative is conservation tillage. This is the largest movement today, towards a solution to the soil degradation problem. It utilises farming practices that leave maximum or optimum amounts of plant residue on the soil surface. The advantages of this system include: higher water infiltration rates, reduced erosion by wind and water, trapping of snow for spring moisture and a reduction in the amount of organic matter lost. Concerns about this system are mainly the short term high costs of fertilizers and herbicides and the effectiveness of chemical weed controls.

Solutions for controlling soil moisture include swathing at alternate

heights, stubble mulching to prevent evaporation, shelterbelts and wind breaks to trap snow and prevent erosion, contour farming, which is tilling across a slope rather than up and down to create wedges to trap water, and cover crops to protect soil from erosion and to add fibre to the soil for improved water holding capacity. Perhaps one downfall of all these methods is that they require more management and planning which is not readily available to the farming community.

Farmers do not deliberately mine the soil. They are influenced by a variety of exogenous factors. Farmers have no control of their product price nor the factor costs to produce the product. Farmers are faced with high equipment costs, high fuel costs, even with purple gas subsidization, rising fertilizer and herbicide costs, man hours and depreciation of existing equipment. The bottom line is that farmrs do not receive enough return on their capital, labour, or expertise to justify long term conservation practices.

The farmer may be reluctant to take a claculated risk and change his traditional agricultural practices to conservation cropping methods. The farmer must be convinced that there is reason for change and he must be able to understand the devastating costs of soil degradation and the importance of soil conservation.

Suggested conservation methods maybe more readily incorporated by farmers if strong incentives and abundant assistance were provided in early and long term stages of farm planning. Farmers gererally do not build conservation into their legers because it has been too expensive in the short run. Society must realize that farmers need short-term gains in order to survive financially. For the long term, farmers must be encouraged to change their practices or our soil resources will be lost. The key lies in increased public awareness of the seriousness of this problem and in improved copmmunication between public, farmer government, researchers, and environmentalists. Some government policy actions might include:

1. more funding for research
2. modify Crow Rate to cover all farm products travelling in any direction
3. change grain marketing quotas - instead of encouraging breaking up of land and fallowing set up quotas for other forage legume crops
4. special taxation policy for farm incomes
5. encourage purchase of equipment for minimum tillage
6. crop insurance policies for those who reduce summerfallow use

7. create a save the soil fund like the Cancer or Diabetes Funds.

However, these will not reduce starvation in the end. It has been stated that there is a need for a western Canadian system which allows farmers to conserve for a profit.

Increased education through junior and senior high school science courses, publications, objective news releases, short courses at agricultural colleges, farm meetings and media are all way to improve the communications breakdown between the public and the policy maker.

Past and present actions taken in the soil degradation area include a number of Acts. In 1934 the Soil Drifting act was passed by penalties were never imposed. In 1964 the Soil Conservation Act came into effect and was revised in 1980. Under this act anyone who owns, occupies, ar controls land shall take active measures to prevent soil deterioration by wind, water, and other causes.

You may ask how involved is the government? Conservation realated research accounted for only 4.7% of the Federal agricultural budget in 1983. One concern with government action is the emphasis placed on production rather than conservation with a production profit.

Is it not time we change our traditional beliefs and methods of summerfallow and other harmful cropping practices? Can we continue to abandon the foundation upon which our life is sustained?

Changes must occur and farmers as well as politicians must begin more implementation of conservation practices. However, the farmer cannot be expected to do this financially alone. Educators, legislators, researchers, citizens, and farmers must join and modify traditional crop practices.

FORT MCMURRAY COMPOSITE HIGH SCHOOL PRESENTATION

"AIR TODAY - GONE TOMORROW"

Presented by: Matthew Carrington, Mike Roth, Kevin Horrocks, Kelly Gray

Issue: "Are the environmental control measures at the Tarsands plants enough to ensure that air quality is not and does not become an environmental hazard?"

Part I, The Problem

What this paper sets out to do is investigate the possible hazard to the environment from the production of pollutants at the tarsands plants. It attempts to discuss the government's regulatory function as well as the physical removal of pollutants. It also attempts to assess the success of the measures that have been taken and the probable success of the measures that may and will be taken.

Part II, Fort McMurray

Fort McMurray is a small city of about 37,000 in northern Alberta. It is situated in the Athabasca River Valley, about 20 km south of the two large Tarsands plants that form the primary economic base for the city.

The two plants are Suncor and Syncrude. Suncor was the first to come into production in 1967. Syncrude came into production later, in 1978.

Part III, Topography of Plants and Fort McMurray

Both plants are located in the river valley, Suncor being on the valley bottom, next to the Athabasca River. Syncrude is located higher in the valley, to the west of Suncor.

Part IV, Government Standards and Guidelines

Government must, in their work, reflect the concerns of a very large and wide range of special interest groups as well as those of the industry and the politicians.

The actual guidelines are formulted by specific procedure that invol-

ves a series of pre-determined steps. These steps are set out by the government in the following manner:

1. Identification of uses for the ambient resource to be protected, or the objectives to be met.

2. Formulation of criteria through collection of and, or, generation of scientific information.

3. Formulation of ambient quality standards from the criteria.

4. Development of effluent standards for discharge into the environment that will produce a quality meeting the ambient standards.

5. Development of monitoring the other information gathering programs which will refine the data inputs to the previous steps and produce feedback on whether the objectives are being met.

There are obviously many restraints placed upon the government when it sets out to create guidelines for any industry. This is especially true for projects as economically important and potentially environmentally damaging as the tarsands plants. Thus, they must come to some sort of compromise between the needs of the industry, the environmental groups, and the economy. The limits moreover, must be set with regard to the individual nature of each of the plants.

It should be noted that the guidelines are set individually by the provincial governments. While the federal government also sets limits, the provincial governments are only required to set guidelines that fall within these federal limits.

Federal guidelines are, in turn, classified into three groups. These being "desirable', "acceptable", and "tolerable". These denoted as desirable are the lowest and those that protect the enviornment the most. Those denoted acceptable are thought to be at the level that will not harm the environment permanently yet be easily attainable for industry. Those denoted as tolerable are generally recognized as requiring upgrading.

The ambient air quality standards set by the Alberta and federal governments for the various different areas of emmissions are as follows:

1. Suspended particulates:

Alberta:	For one year:	60 ug/cu m
	for 24 hrs:	100 ug/cu m
Federal:	for one year:	0 – 60 ug/cu m is desirable
		70 ug/cu m is acceptable
	for 24 hrs:	120 ug/cu m is desirable
		400 ug/cu m is acceptable

2. Nitrogen Dioxide:

Alberta:	for one year:	60ug/cu m
	for 24 hrs:	200 ug/cu m
	for 1 hr:	400 ug/cu m
Federal:	for one year:	60 ug/cu m is desirable
		100 ug/cu m is acceptable
	for 24 hrs:	200 ug/cu m is acceptable
		300 ug/cu m is tolerable
	for 1 hour:	400 ug/cu m is acceptable
		1000 ug/cu m is tolerable

3. Carbon Monoxide:

Alberta:	for 8 hrs:	6 mg/cu m
	for 1 hour:	15 mg/cu m
Federal:	for 8 hrs:	6 mg/cu m is desirable
		15 mg/cu m is acceptable
		20mg/cu m is tolerable
	for 1 hour:	15 mg/cu m is desirable
		35 mg/cu m is acceptable

4. Hydrogen Sulphide:

Alberta:	for 24 hours:	4 ug/cu m
	for 1 hour:	14 ug/cu m
Federal:	no limits	

5. Suphur Dioxide:

Alberta:	for one year:	30 ug/cu m
	for 24 hours:	150 ug/cu m
	for 1 hour:	450 ug/cu m
Federal:	for one year:	30 ug/cu m is desirable

	60 ug/cu m is acceptable
for 24 hours:	150 ug/cu m is desirable
	300 ug/cum is acceptable
for 1 hour:	450 ug/cu m is desirable
	900 ug/cu m is acceptable

It should be noted that the Alberta government has, on the whole, set standards and guidelines that fall within the limits set as desirable by the federal government.

Part V, Environmental Impact

Public concern has been raised over recent years by the widespread damage to forests and lakes all over the world by sulphur depositions. In 1980 a study estimated that by the year 2006, the total cumulative sulphur emissions for all of Alberta will amount to over twenty-one billion kilograms.

In 1975, the Alberta government in conjunction with the tarsands industry created AOSERP, the Alberta Oil Sands Environmental Research Program. Most of the reports used in this presentation were generated by this organization. The AOSERP study area covers over 30,000 square km centered on the Fort McMurray area and stretching as far north as Fort Chipewyan.

Because of the complexities involved in studying the environment as a whole, it is necessary to divide the topic into smaller sections of specific interest in order to provide a more comprehensive overall view. The topics we have chosen to use in our studies of air-borne sulphur pollution are:

1. Air
2. Soil
3. Water
4. Effects on Plant life.

1. Air

The tarsands plants are the largest single source of sulphur emissions in Alberta. The Suncor and Syncrude plants are licensed by the Alberta government to emit 348 metric tonnes of sulphur every day. The average for each tarsands plant is actually about 147 metric tonnes per day. Although this is wll below government guidelines, Suncor (the only tarsands plant operating in 1978, the year of the

study) had consistently exceeded their licensed half hour limit of 0.2 ppm more than any other sulphur producing industry in all of Alberta.

It was estimated that the sulphur drops out of the plume stream in the following manner:

- 25% after 200 km
- 50% after 500 km
- 75% after 1000 km

2. Soil

The soil in the Fort McMurray region is divided into three types: the sandy soils (brunisols), the clay soils (luvisols), and muskeg. The first two soil types have very different buffering capacities (the ability to absorb excess acidity). This affects the reactions that these soils have with the sulphur in the air. The average deposition of sulphur is 5 kg/ha, which results in concentrations of 9 to 203 ppm in the Fort McMurray area.

A 1981 biomonitoring study examined and analyzed soil samples from the top eight cm dating to 1975 and compared them to the normal accepted values of the Fort McMurray area. They also examined the buffereing capacities of the different types of soils in the region. They found the following results.

A. There were isolated incidents of excess acidity in nine of the forty samples. But during some thirteen years of Suncor (the only plant operating at the time of the study), operation the soils exposed to the sulphur depositions fluctuated as would normally be expected.

B. The soil conductivity was found to be within the 38 - 320 micro-ohm range. No detrimental effects on plant growth have been noted in even the 0 - 2000 micro-ohm range.

C. It was determined that the luvisolic soils had the highest buffering capacity, while the brunisolic soils had a substantially lower buffering capacity.

3. Water

Lakes in the AOSERP study area are very alkaline (high pH), and thus have a high buffering capacity.

The addition of acid sufficient to cause pH changes in the surface waters of a lake will have the following effects:

A. The altering of the normal carbon distribution balance in the lake waters. Changing the carbon distribution in acidified waters has been shown to effect the survival of fish in the lake.

B. There may be an increase in heavy metal concentrations in the lake.

A study done in 1979 reports that a precipitation pH value of 4.0 or lower would be needed to cause any significant changes in the lakes natural pH level. Reported precipitation pH values were between 6 and 7.5, not low enough to cause acidification of lakes in the Fort McMurray region.

4. Effects on Plant Life

A large portion of the studies in the AOSERP area have concentrated on the effects of the sulphur contaminated soil, water, and air on the regional plant life. Plants are one of the best indicators of the combined sulphur effect, and by monitoring and testing plants, it is possible to know the effectiveness of the government guidelines, pollution control measures, and environmental modelling techniques. By stressing these areas, it is hoped that it will be possible to refine the pollution control system at the plants.

There are three types of visible sulphur dioxide injuries recognized in Alberta: "acute", "chronic", and "transient". Acute damage refers to permanent damage to the plant, and has only been observed in Alberta immediately adjacent to burning sulphur.

Chronic damage is characterized by a yellowing of leaf tissue due to reduced metabolic processes as a result of sulphur exposure. The yellow leaves remain only until renewed in the following growing season.

Transient symptoms are only temporary and require close, regular observation of the organism's growing patterns to detect.

As a result of many laboratory studies, the threshhold levels of sulphur dioxide required to cause foliar stress have been identified.

Lichens can be killed by sulphur dioxide fumigations of 0.154 ppm.

Temporary damage is usually associated with fumigations between 0.087 and 0.154 ppm. The Suncor and Syncrude quarter-hour guidelines give a limit of 0.17 ppm, well above the concentration needed to kill lichens. It should be noted, however, that lichens are used in many environmental surveys because of their extraordinary sensitivity to sulphur dioxide.

Studies in 1977 showed that concentrations of 0.01 to 0.025 ppm sulphur dioxide over a twenty-two hour period caused a change in the chemical balance of jack pine foliar tissues. The figure 0.01 ppm is significant because it represents the maximum yearly concentration set out by the Alberta Government. The twenty-four hour limit, however, it six times higher - 0.06 ppm. Obviously, trees could be exposed to these levels while still remaining within government guidelines.

Another study exposed pine seedlings to 0.35 ppm sulphur dioxide for 24 hours. Visible injury was evident after 3.5 hours. Injury was visible after 1.5 hours at a concentration of 0.5 ppm.

A different study examined not only the visible symptoms, but the invisible ones. They analyzed the carbon dioxide exchange of plants while growing in clean air and while growing in air polluted with 0.34 ppm sulphur dioxide. There was a sharp decline in carbon dioxide respiration after the contaminated air was introduced into the test chamber. But 0.34 is a concentration over twice that allowed in even the quarter hour limit.

The impingement zone was defined in a 1976 biomonitoring study as an area between three and six km south-southeast of Fort McMurray. This is an area in which the plume makes contact with the trees. These trees suffered chronic stress, yellowing of the leaves. the leaves were renewed the following year, as the affected areas tends to shift within the zone.

Also observed in the biomonitoring study were lichen conditions. the lichens were observed to have a "deterioration of vitality and productivity as indicated by pigment changes and tissue deformation." It should be pointed out a second time that lichens are sensitive to sulphur dioxide levels below emission limits and therefore some deterioration should be expected.

Thus it is obvious that some damage is being done to the environment. Most of it would be termed 'stress' however, for it is not permanent. We did not, however, research the effect that the pollutants and plant

stress had on wildlife, so we really don't know how far-reaching the damage is.

Part VII, Machinery Involved in Pollution Control

There are several different stages and functions in the anti-pollution equipment at the tarsands plants. These include the following:

A. The sulphur recovery plant
B. The electrostatic precipitators.
C. The main stack.
D. The flare stacks.
E. The monitoring stations.
F. The static monitoring devices.

A. The sulphur recovery plant manages to recover about 96.5% of the sulphur in the waste gasses.

B. Electrostatic precipitators are used to remove fine ash particles from the flue gasses. They do this by ionizing the ash particles and then collecting them on a charged plate. From here they are automatically dumped into bins every few minutes which are emptied regularly.

C. The main stack, as the point at which the actual emission occurs, has been a focus of attention. Over the years many suggestions have been made as to possible further extraction of pollutants at this stage. They have all, however, been discarded as impractical, either financially or in terms of their net benefit to the environment. So far as we know, aside from some monitoring equipment, the main stack is not using any form of anti-pollution equipment.

D. The flare stacks are a precautionaly measure used to bypass all the usual emission systems. They are used supposedly only in emergencies as they obviously do not clean the air at all. Figures were not available on the actual flare time and the emissions during those times.

E. Both plants have five monitoring stations stationed on their lease. These stations automatically measure sulphur dioxide and hydrogen sulphide and update the central computers every few seconds. The locations of these stations are determined by the Alberta Government.

F. There are forty static monitoring devices, or 'candles', scattered about the lease of both plants. They are used to monitor sulphur deposition. They have two sections: the first is sensitive to certain levels of sulphur dioxide, the second is sensitive to certain levels of hydrogen sulphide. The plant chooses the site for these devices.

Section B, Part I, The Future

The following are major events presently planned for the future of the tarsands industry:

1. 1987 - Both Syncrude and Suncor will expand using newer technology to decrease emissions of pollutants by about 30%.

2. 1990 - A new tarsands plant is scheduled to come into production at Cold Lake.

3. 1992 - Syncrude, Suncor, and Cold Lake plants to be able to cut sulphur emissions by 30% again.

4. 1993 - The Canstar plant is scheduled to go into production.

5. 1996 - The Sandalta plant is scheduled to go into production.

6. 1999 - The Cold Lake plant scheduled for expansion.

7. 2002 - The Texaco plant scheduled to go into production.

8. 2005 - Mining at Suncor is scheduled to stop.
   Shell plant at Peace River scheduled for start-up.

All of these projects, except for the expansion at the Suncor and Syncrude plants in 1987, are still dependent on economic trends in the petroleum industry.

Part II, Future Programs at the Existing Plants

Both plants at this time are planning to upgrade their present pollution control equipment to a newer technology. The following are the ways in which the two plants will be upgrading in attempts to reduce their emissions of pollutants:

1. Suncor plans to install new equipment that will remove more

sulphur from the flue gasses. This will be a two part program beginning in 1987. The second part will be implemented in 1992.

2. Syncrude will be implementing two programs sometime next year. The first of these programs will involve a new expanded sulphur removal plant. This will remove sulphur from the gas before the stack. The second program that should go into effect is one that will be installed to remove sulphur from the tailings gasses themselves.

Part III, Extrapolated Data on Emissions

Pollutant emissions in the future are obviously as dependent on the economic condition and trends as are the planned plants. With slight generalization, two predictions can be made, one for a favourable economic climate and one for an economic climate that proves detrimental to the tarsands industry.

Part IV, Programs to Continue After Shutdown at the Plants

Actual production at the Suncor plant will cease in the year 2005, and the plant will become inactive in the year 2006. However, there will be programs continuing that will attempt to see that the environment is returned to a condition that is as close to its original state as is possible.

The programs that will continue are as follows:

1. The excess overburden will be used to refertilize the area. This method has proven very effective in the past and it is hoped that it will continue to be so.

2. Many of the tailings ponds will have the man-made sludge pumped out and transferred to a more centrelly located, better sealed pond. These relatively cleaned ponds will then, for the most part, be left on their own to recover. It is hoped that it will take only a few years for these to become clean to the point at which they can be used by the inhabitants of the surrounding forest without danger.

Part V, Conclusion on the After Effects of The Plants

The land reclamation program has already proved itself to be a success on small areas is a rigidly controlled environment. What remains to

be seen is whether it will be able to reclaim such a massive area as the plants presently occupy. It also remains to be seen wether or not they will be able to reture the tailings ponds to their original condition within a reasonable length of time. However, a number of experimental programs have, to date, been a success. So it is hoped that these successes will continue on after the plant has closed down to return the surrounding area to its original condition.

Conclusion

As we collected information for our report, a number of things became obvious. the two main things were firstly that both the tarsands plants are genuinely attempting to protect the environment as much as is possible. the other thing was that in spite of these attempts, some damage has been done to the environment.

Again, it is necessary to place the problem of environmental pollution in perspective, there is a wide range of needs in our society and not all of them can be completely fulfilled. While it would seem that both the plants are doing some damage to the environment, it would also seem at this time that most of the damage will be temporary.

There are, of course, some exceptions. The tailing pond into which all the sludge was pumped will not return to its original condition in the foreseeable future. It will not present an actual danger to the environment after the first few years, but will not teem with life as it once did.

MATTHEW HALTON COMMUNITY SCHOOL

Issues from the Three Rivers Dam Proposal

Three Rivers Dam Study Group:

In this seminar we will present issues and give both positive and negative effects of the Three Rivers Dam Project. In no way are we trying to make decisions for you. That part we would like to leave up to yourselves. First we would like to give you a short history of the project.

NEED

Southern Alberta has always been one of the driest areas within Alberta. Every 25 years, we face a series of extremely dry years, such as the last three years. A dam proposal was suggested in order to supply a regular water flow within the major drought areas in Southern Alberta. The proposed Three Rivers Dam will increase potential irrigation acreage for the surrounding farmsteads, however, the dam will mainly benefit the Lethbridge Northern Irrigation District and the St. Mary's District. The dam will enhance regulation of the water runoff in the spring and be better controlled during the months of July and August when the water demand for irrigation is needed the most. Even though the dam will affect the environment and some farming operations, the government decided it would be more effective than destructive. With consideration, the Three Rivers Dam in the most suitable site for onstream development, mainly because of its overall ability to meet all of the major needs for the lowest cost. There were many different sites which were investigated.

CHOICE OF SITES

There are many different areas that were considered before they chose the Three Rivers Site. These areas were Three Rivers, Brocket, Fort Macleod, Mud Lake, Keho Lake, Forty Mile Coulee, and Chin Coulee.

First, we will look at the ONSTREAM STORAGE AREAS.

Three Rivers site in on the Oldman River, with available live storage of 398,000 acre-feet (on a per acre-feet basis). The dam has an estimated cost of 114 million dollars. This site also has sound geological base for construction and seepage is not likely to be a problem.

Brocket is the next site downstream from the Three Rivers site and is located within the Peigan Indian reserve. This site would have live storage of 340,000 acre-feet with the cost estimated at 112 million dollars. There are, however, still questions regarding the strength of the base for stability and the potential for seepage.

Fort Macleod is the third feasible location on the Oldman river. This site has live storage of 245,000 acre-feet, but could be increased to 305,000 acre-feet. The increase would need further study. This site has an estimated cost of 99 million dollars.

OFFSTREAM STORAGE AREAS

Mud lake is 8 km north west of Fort Macleod, and is a natural depression immediately beside the Lethbridge Northern Irrigation District main canal. The main idea was to provide 65,000 acre-feet of additional storage. The estimated cost is $24 million. Seepage is one problem that would be investigated because of the location of dikes.

Keho Lake is offstream of the Lethbridge Irrigation District main canal which would be raised 2 metres to provide an additional 30,000 acre-feet of live storage with an estimated cost of $6 million. This is an attractive project because it could be done simultaneously with the LIND main Canal.

Forty Mile Coulee is 60 km south west of Medicine Hat and has a potential 70,000 acre-feet of live storage with an estimated cost of $36,000 million. This project would require two dams that would be built over a period of 2 to 3 years.

Chin Coulee is now used as a storage reservoir by the SMRID and could have its live storage increased by 140,000 acre-feet at a cost of $32 million.

On Thursday August 9, 1984, the government of Alberta announced the decision to build the dam at the Three Rivers site on the Oldman River. This site was chosen for a number of reasons:

The dam at the Brocket site was estimated at costing $72.5 million more for construction and reservoir costs than the Three rivers site.

The Three Rivers site has 400,000 acre-feet of storage compared to the 380,000 acre-feet at Brocket.

The Three Rivers site has potential for hydro-electric power.

Water seepage will not lead to salinity problems.

The montain waters in the area carry so little silt, compared to the other sites, that deposits will not plug the dam.

LOCATION - PHYSICAL AND BIOLOGICAL HISTORY

The proposed Three Rivers Dam site is located in southern Alberta, five miles north of Pincher Creek. The three rivers - the Oldman, Crowsnest, and the Castle - are part of the Oldman River basin which drains into the South Saskatchewan River.

The physical area that will be affected consists of 69% grassland and 20% treed. Over 42 families will be directly or indirectly affected. The geological surveys going on right now seem to indicate little, if any, percolation will occur.

The construction of the dam will result in a minimum loss of 1715 ha (5800 acres) of land. The effect on wildlife will be adverse, the area that will be flooded supports mule deer, white-tailed deer, carnivores, furbearing animals, and small mammals. Bird populations will also be affected, as they will lose their feeding and nesting grounds, like the great horned owl, sparrows, robins, perching birds, and the endangered merlin or prairie Hawk. Fish populations will also be affected, as the rivers downstream from the dam will not be any good for cold stream fishing, as the dam will warm the stored water to a higher temperature than normal.

DAM AND LAKE DETAILS

The Three Rivers Dam will be extremely large. It will be 25 miles long and back up water over 35 miles of stream beds from the Castle, Crowsnest and Castle Rivers. This dam will be located 5 miles north of the town of Pincher Creek. The maximum height of the dam will be 235 feet, with a crest height of 1440 feet. The elevation at the top of the dam will be 3680 feet. The capacity at the full supply level will be 400,000 acre-feet, but the useable storage level will be 398,000 acre-feet.

If a hydro-electric power generator is installed, the dam would produce a potential of 132,000 Mwh.

Many acres of land will have tobe sacrificed to build this enormous dam. Approximately 4,814 acres of land in it's natural state will be lost. Also about 4,690 acres of agricultural land will be flooded. Farming operations will also be affected. Forty-two land titles will be affected by the reservoir, and 20 out of these will lose at least one farmstead.

Other operations must also be taken into consideration. Also flooded will be three secondary roads, access roads, oil pipelines, gas service lines, telephone and power lines, and a portion of the railway.

As you can see this dam has many advantages and disadvantages. However, for progress to continue, many sacrifices have to be made.

ECONOMICS

The total cost for the dam at the Three Rivers site on the Oldman River is estimated at $200 million. In addition to this, $1.2 million will be used for relocating farmers and ranchers whose farms will be flooded. Also, $0.5 million will be used for the purchase of farmsteads.

It has been estimated that thirty million dollars will be spent in the communities surrounding the Three Rivers Dam. This money will be spent in the form of supplies such as groceries, fuel, lodgings, transportation and other such necessities.

The physical construction of the dam, beginning in 1986 will create 1400 man-years of employment in the actual construction and engineering. Along with the injection of $30 million into the local communities, it is estimated that 30% of the total 1400 man-years of employment will be generated locally. The total direct and indirect employment in the province over period of construction is estimated at 1900 jobs and the peak work force at the construction site is estimated at 600. As soon as the dam is ready for operation, which will be in the 1990's, there will only be five people who will run the dam.

WATER MANAGEMENT

Each year there is 7.5 million acre-feet of runoff caused by the melting of winter snows. At least one half the amount of water each spring could be stored and used in the usually dry summer months. Since southern Alberta has been hit with drought from 1977 on, the Oldman dam would greatly benefit most of the area. The reservoir

would increase the production of hay and grain anywhere from 10 to 50 times what is now presently being produced.

Alberta has an agreement with Saskatchewan and Manitoba to insure that at least 50% of Alberta's water is transferred to the other two prairie provinces. Therefore, water flow is monitored closely on all of Alberta's rivers. At the present time, Saskatchewan and Manitoba receive 50% to 80% of the total water flow.

With a reservoir, water priorities must be figured out and controlled closely. First of all, Saskatchewan and Manitoba must be allowed their share of water so that it maintains a good quality. Secondly, fish and other animals need a certain amount of water for survival. Thirdly, the treatment of sewage must be stabilized so as not to endanger the fish or water quality. It has been found, however, that a little sewage does enhance fish growth. The use of the reservoir for irrigation has to be managed so that the fish have enough water and the farmers have enough for their fields. Although less important, recreation should be taken into consideration so that the fluctuating levels don't get out of hand.

Another serious point to ponder is that the dam will take three years to fill. Now, half of the dam is drained off in a dry year, and it may take 1.5 to 2 years to refill.

To sum it all up, water management is a major factor involved in the building and operation of the Three Rivers Dam.

TIMETABLE

The idea of a dam on the Oldman River has been around for many years and the decision was not taken lightly. Many general studies have been done during the 1960's to investigate both the positive and negative effecs of dams. More recently, though, specific studies have been carried out through the 1970's and 80's to study the effects of the Three Rivers dam on local inhabitants, environment and economy. It is from these reports plus additional hearings and public forums, that the Alberta Government has reached its decision on the dam. Their final decision, to build a dam at the Three Rivers site, and construction be begin in the year 1986 and completion of the dam to be around the year 1990.

Now with the history lesson over, we would like to present some of the issues. The infromation used to present the positive and negative

effects was obtained in four ways:

1. government studies and reports
2. local interest groups
3. public seminars
4. our own local surveys in which the local students were questioned.

Our results of the survey showed that 61% of the people felt that they had a lot of information about the Three Rivers Dam project, leaving 39% of the people who said they were not adequately informed.

Our final question of the survey was: "What are some alternatives to building a dam?"

40% said more study
13% said more water efficiency
16% said the government should use offstream storage
12% said there should be no dam at all.

Our first issue is:

1. Are the benefits which we will receive from the dam worth the cost?

2. What are the effects on the environment?

3. How do we justify the loss of land and occupations?

4. Was the future society of the year 2000 well enough informed?

5. Was onstream storage necessarily the best answer to our problem?

6. Are current irrigation systems effecient and adequate enough to handle the water conserved by the dam?

7. How will our community prosper?

8. Why was the Three Rivers location the best site? Was it a political decision or was it based on environmental concerns?

9. Are there going to be any useful side effects of the dam?

10. Will the dam be affected by the logging out of the forest

upstream from the dam?

11. Is the dam necessarily needed right now?

COST VS RETURNS

PRO

The proposed Three Rivers Dam costs the least and gives the best storage capacity, making it the cheapest in terms of dollars/acre-foot. The dam will benefit an estimated 80,000 farmers, and it will allow the irrigation districts to supply 100,000 - 200,000 extra acres with water for irrigation districts. If a regulated supply of water is given to the farmers it will allow them to grow specialty crops, or increase regular crop yields which will allow a farmer a greater profit that will benefit communities and governements alike. The direct and major benefactor of the dam is the farmers of the Lethbridge Northern Irrigation District (LNID), whose local incomes support most of the businesses around the area. With the building of the dam, the LNID will hopefully be able to stop the shutdowns that have plagued them in the dry summer months for the past few years. The dam will also help other irrigation districts to a lesser extent all the way to Hudson's Bay.

CON

I feel that the dam is not worth the amount it will cost to build. The taxpayers are the ones who will probably end up paying for it. What benefits will they derive from it? When they build the dam, the businessmen and the town as a whole, will benefit, but what happens to them after it is built? What happens to the businesses then?

There are also great environmental costs when the dam is to be built. Trees and animals that live there will be flooded out and forced to find a new place to live. It must also be emphasized that all the environmental costs will be in the upper end of the river basin, while downstream users will gain most of the benefits.

I feel that dams provide quick short-term solutions to water use problems but cost a lot of money to build and even more to repair and maintain.

Why should the taxpayers invest millions of dollars for the dam when it will last only a short time?

WILDLIFE

PRO

The contruction of the Oldman Dam will create a decrease in the present plant and animal populations in the general dam area. However, wildlife such as birds, animals, and rodents, will not be entirely lost. They can migrate either upstream or downstream of the dam. The wildlife forced to move will have no problem adapting to a new environment because it is exactly the same as their present home.

On the other hand the trees and plants that will be flooded by the dam will unfortunately be lost. I feel that the loss of trees and plants from such a small portion of a river valley is an extremely small sacrifice, as compared to the huge benefits of the reservoir.

CON

Is the dam really worth the destruction of plants and animals? Can we really be responsible for such a beautiful loss?

There will be an extensive amount of birds, mule deer, reptiles, rodents, and amphibians which will be lost or forced to move into another already full ecosystem. Five thousand, eight hundred acres of land will be flooded with will result in a serious environmental change. After the completion of the dam, some fish population are expected to inhabit the reservoir. But on the other hand, there will be an extreme impact on cold water fish that will be lost near the dam's lower end. The flooded land has always been a popular area for fishing, camping, and it makes a beautiful spot for a beautiful Sunday walk. There are small coniferous forests which stand on the north side facing the river banks. All these trees enhance a tremendous attraction towards man, and both domestic and wild animals. Birds use these grounds for wind protection and shelter. Even insects and small rodents depend upon these natural shelters. Instead, now they will all have to take lessons in swimming. I know research is being done to aid with the lessening of the impact resulting from the reservoir, but environmental damage must not, or cannot, be justified only in terms of economic growth. We must always consider the destruction of such a beautiful river basin.

HOMESTEADS

PRO

The 42 farms and land titles that will be lost due to flooding will be purchased by the government, determined on the appraised market value of the land with improvements plus extra fees for relocating, inconvenience, and disruption the landowner will undergo. The government will take a very flexible approach with regard to the purchase of land required for the dam and reservoir and land owners affected by the dam will be treated fairly and equitably making sure the land owners do not suffer any financial loss.

In the recent acquisition of lands for the Dickson Dam on the Red Deer River, a fair process was developed to obtain the lands. The fact that the government did not have to take the land away from the owners or disposses the owners was not necessary at the Dickson Dam, indicates that most land owners there felt they were treated fairly.

The farmer whose land is going to be flooded away as a result of the dam has a deep attachment for his land and memories associated with the land will be flooded away, but he gets another chance to create new memories and start out fresh, without old problems that may have been associated with the old farmstead.

CON

There is a very great sociological impact that the dam will have in this area.

The dam will affect a great number of people, some whose land will be completely flooded, and other only parts of their most valuable land will be lost. Approximately 42 land titles will be affected. the area is mostly ranch land, the ranchers have taken great care and time into getting their land what it is now.

People whose parents or grandparents homsteaded this land will be required to leave. Decades of work, momories, and landmarks of life will be erased by tons of water. In the meantime, the ranchers and farmers must live with the knowledge that they have to find another home within the next two years.

And the government feels that money will compensate for the great losses that are going to be brought forth to the ranchers in the area.

So maybe you can understand why there are so many hard feelings among the people directly affected by the dam.

Why should we sacrifice our land, from which others downstream derive the benefits?

COMMUNICATIONS

PRO

Although I state that the future generations were not informed as they could have been, a local high school survey said that 61% of the students were informed about the project, and 39% said they were not informed enough. The decision needed to be made now! The government couldn't wait for the teenagers to ho hum around, trying to make a decision. Although we did not have any real direct input into the decision, we could possible benefit in the construction areas. There are many capable and eager young adults in the Pincher Creek area. The governemnt proposed for local manpower. I would like to see that promise fulfilled. Although we cannot do the deciding, we can do the building and maintaining.

CON

We, young Albertans, are the people of the year 2000 but are we informed about decisions that affect us and we will have to face later on? Personally, I don't feel we are. I know that on the decision for a dam at the Three Rivers site, myself, and most of the community had very little input into the final choice.

Also, newspapers don't present information that well because they are too biased. Newspapers give one opinion and stick to it.

We are the generation of the year 2000, shouldn't we at least have a little input into decisions that affect our community. After all, we are supposed to be young, intelligent Albertans expressing our views and concerns about government actions.

ONSTREAM STORAGE

PRO

Onstream storage, in most cases is the cheapest and best way to store water. It provides a lake size reservoir of water which can be used

for recreational purposes, unlike offstream which are usually small and cannot be used for anything. Onstream can make electricity through hydroelectric generators in the dam, while offstream needs a source of power to pump water from source to the actual site. Some offstream storage sites have a higher construction cost, as they may have to be lined with rip-rap, or concrete due to the percolation that may occur, while onstream costs are mostly related to the actual costs of making the dam.

CON

The debate between onstream and offstream storage is argued between cost, storage capacity, and the impact on man and environment - socially and economically. I do agree that off stream storage systems are not the most efficient way to store water, but is the cost of building the dam worth all the trouble? Or would it be cheaper to just upgrade the offstream storage systems like Keho Lake or Mud Lake? Or upgrade the presently inefficient irrigation systems? Also, could an offstream storage system have a lesser effect on man and his environment?

IRRIGATION EFFICIENCY

PRO

One of the main issues which was considered for proposing onstream storage on the Oldman River was to see if irrigation systems would be efficient and adequate enough to conserve the water stored by the dam. Of course, there are other alternatives such as the upgrading of open canals and offstream storage sites. Even if canals were to be upgraded there wouldbe a higher chance of leakage and evaporation occurrences than with irrigation pipes. The Summerview area is one of the closer areas around the dam pertaining irrigation potentials. The area's irrigation potentials could be increased from 1860 acres of presently irrigate land to between 10,000 and 15,000 acres. I don't think that open canal systems would benefit Summerview as much as irrigation pipelines do. Other irrigation distirict such as the Lethbridge Northern and St. Mary's District will also benefit irrigaion potentials from the proposed dam. Some people feel that offstream storage and canals would be more substantial than onstream, but since the government did extensive research on all three proposals then I think they would only choose the most economical and beneficial storage. If open canals can be upgraded and improved to be more efficient than I feen irrigation systems could also be improved on

with greater benefits resulting.

CON

Irrigation is a priority when it comes to farming and ranching. But if we were to have a better management of the current irrigation systems, would there be a need for the dam?

All that the dam is really doing is giving us more water to waste. With the better water supply form the dam, not much more is used. When you pump water down a leaky open canal, how much really gets to the crops? When you consider all of the water that leaks out of the canal and the amount that evaporated on the way to the crops, not much more water makes it. Why not consider upgrading the canals, instead of giving us a dam to have more water to waste? We could stop flood irrigation. With flood irrigation you have no control over what water goes where. A lot has to go to more than just the crops.

So if we were to improve and control our irrigation habits, I don't believe we would need the dam for irrigation purposes. We could have enough water if we were to control our uses of it.

COMMUNITY BENEFITS

PRO

The Three Rivers Dam will provide many community benefits. It will basically increase the cash flow in the surrounding towns through several ways. For example, the sales of clothing, food, and vehicles will climb drastically. The many out of town people working on the dam will need these items that are listed above. The local recreation centres, which employ local people, will also profit from the increased sales of items and uses of facilities.

So as you can see, the reservoir does help out the community tremendously. Now I ask you, the concerned citizens of the province "Why look a gift horse in the mouth?"

CON

The community benefits will only be for a short term as the dam's actual construction is estimated to take several years and our community will boom for several years, but when construction comes to an end, the boom will come to a very abrupt end. There will be five people needed to run the dam, but this will barely scratch the surface

as there is an estimation of five families leaving the area, and I believe that this figure will rise. Recreation benefits will be minimal as our area is always windy, and if there is any benefit it will only be in the summer months, as there will probably not be enough recreational facilities available, and in the winter high winds will make ice related activities dangerous.

LOCATION/SITE

PRO

The government decided that the Three Rivers site for the Oldman Dam would be in the best interests of Albertans. They chose this site for a number of reasons. The dam at the Brocket site was estimated at costing $72.5 million more for construction than the Three Rivers site. The Three Rivers site also has a larger storage capacity. It has 400,000 acre-feet compared to that of 380,000 acre-feet at the Brocket site. In addition the Three Rivers site has more hydro-electric and recreation potential.

The decision to proceed with the Oldman Dam reflects the government's committment to balanced economic growth and to ensure an ample supply of water for multi-purpose uses.

I feel that a dam on the Oldman River is necessary in the best interests of water resource management for the benfit of Albertans. It is a necessary decision to provide for secure supply of water for southern Alberta of the 1990's and in the future.

CON

If the dam is built at Three Rivers, the environment will suffer greatly, especially two species, the Merlin or Prairie falcon, and a unique species of cactus. The government chose Three Rivers for cost reasons, with no considerations for wildlife. The Three Rivers site affects wildlife the greatest, than any other location. The cost of the dam falls on the taxpayer and cost overruns will probably occur due to unforseen problems, costing you more money. Our local community will benefit only for a short time, so the recreational benefits that are supposed to replace construction costs will depend on the weather, which is mostly windy. There will be little chance of winter related activities due to high winds.

RECREATION

PRO

Southern Alberta always wants a chance to expand on their tourism capacity and recreational facilities. Well with the construction of the Three Rivers Dam, they will get more than just that. The water oriented recreation facilities situated on the reservoir will help to contribute to a large majority of the tourism within the surrounding communities. Plans are being made to develop camping and picknicking areas around the outskirts of the reservoir. I don't know about you but I sure can't imagine a more impressionable site that a lare green-blue body of water highlighting the Rocky Mountains. Canoeing and fishing for brown trout and mountain whitefish will also become a major attraction. Sailing would be perfect since Pincher Creek is quite frequently faced with high winds. With this large body of water water skiing would be highly recommendable since it makes for a great Sunday activity. Some of the opportunities that present themselves as the result of the dam are an increase in tourism. Thus, facilities are being built for camping, picknicking, and water-oriented recreation.

CON

The possibilities for the recreational use of the dam are present. But due to some structural problems of the dam, and the climate of the area, would make the recreational use an extemely dangerous risk. The basic recreation we are talking about are: coaneing, kayaking, sailing, power boating, wind surfing, fishing, camping, picnicking, and water skiing. Only two of these activities benefit from the powerful westerly winds common to this area. Otherwise, the rest of the recreation will have to catch a calm and sunny day to be enjoyable. This is highly unlikely because those conditions are seldom and irregular to the Pincher Creek area. The east-west direction of the reservoir wouldn't help matter any because it will just increase the already powerful winds.

Also the shoreline will fluctuate making it difficult to unload boats, swim, camp, when the use is at its peak - July and August.

A great fishing industry will also be affected. The well adapted and popular rainbow trout will be difficult to find, since they require cold mountain water. The dam is supposed to be inhabited by mountain whitefish and brown trout. However, the dam will also attract undesirable fish like pike. So according to me the recreational aspects

of the dam are not beneficial.

WATERSHED

PRO

The more trees logged out of the basin, the greater the possibility that the runoff in the spring would be quite rapid.

So it could take with the runoff some of the most valuable topsoil, into the dam, it could cause silt deposits in the dam which could possible plug it.

When the trees are cut out of the Oldman River basin, the area where winter precipitation is normally stored it taken away. When spring comes, the runoff is of most importance, but without the tree shelter, it is not available.

So in months of dryness, there is no runoff available, for it all melted early in the year.

I feel for best water management, the trees around the dam are of great importance.

CON

It has been proved that logging does not increase the loss of moisture in an area. Chinook winds take the same amount of moisture from a piece of land whether trees are present or not. For example, an experiment was done in 1910 at Wagon Wheel Gap, Colorado, where two small areas of forest were metered for eight years. One area was then logged and the other was not. Both forest regions were metered for another seven years. The results of the 15 year experiment showed that the logged area actually produced 15% more water than the forest region left untouched. This experiment shows that logging does not harm waterheds but in fact helps it out.

The dam will be effective as far as watershed goes because even if the spring runoff comes down, the rivers past the dam will be capable to handling this volume of water. In the summer, watershed is not a factor of the dam. The reservoir will be adequately supplied with water from the regular river flows.

NEED

PRO

The dam is needed now! Southern Alberta has been faced with a number of dry years, beginning in 1977. This precious resource has to be stored, not wasted. The farmers could irrigate in the driest months of the year – July and August. Also, upgrading offstream storage and irrigation systems would not be as efficient as the dam itself. Alberta has an agreement to pass 50% of the Oldman River's flow to Saskatchewan. Where is that 50% going to come from when in the summer, the river has barely enough to support southern Alberta. Not only could this dam store water all year-round, but it could be a major tourist attraction in the region, along with the beautiful Rocky Mountains.

CON

Eventually a dam will be needed but not now. Who will benefit from this dam? Not the farmer who gave up precious land or the surrounding farmers. Local farmers will very unlikely to be able to irrigate. There are a large number of dryland farming operations in southern Alberta which recieve no benefits from the presence of irrigation. So, the people who will probably benefit are the ones in the Lethbridge Northern Irrigation District. They want a dam right now so they can use the water for irrigation without having to ration water or possibly shut down in case they have a series of dry years.

How about town growth? Sure, the town will boom for a while, but how long will that last? What will it be like 10 to 20 years down the road?

SUMMARY

To summarize, we will review the issues:

1. Are the benefits which we will receive from the dam worth the cost?

2. What are the effects on the environment?

3. How do we justify the loss of land and occupations?

4. Was the future society of the year 2000 well enough informed?

5. Was onstream storage necessarily the best answer to our problem?

6. Are current irrigation systems efficient and adequate enough to handle the water conserved by the dam?

7. How will our community prosper?

8. Why was the Three Rivers location the best site? Was it a political decision or was it based on environmental concerns?

9. Are there going to be any useful side effects of the dam?

10. Will the dam be affected by the logging out of the forest upstream from the dam?

11. Is the dam necessarily needed right now?

To conclude, we would like to leave you with these questions:

1. Do the positive effects outweigh the negative effects?

2. Do the negative effects outweigh the positive effects?

3. Is there a solution to this problem?

Ms. Laura Akitt
PINCHER CREEK, Alta.

Mr. Darren Armstrong
HINTON, Alta.

Ms. Audrey Au
EDMONTON, Alta.

Ms. Loretta Belcourt
GRANDE CACHE, Alta.

Ms. Patti Best
PINCHER CREEK, Alta.

Ms. Sheila Borle
BUCK LAKE, Alta.

Mr. Cam Bowes
EDMONTON, Alta.

Mr. Brad Bowslaugh
BRANDON, Manitoba

Mr. Dave Brower
BERKELY, California

Mr. Craig Buchholz
REDCLIFFE, Alta.

Mr Ian Bullock
PINCHER CREEK, Alta.

Mr. Charles Caccia
OTTAWA, Ont.

Ms. Cindy Campbell
MEDICINE HAT, Alta.

Mr. Matthew Carrington
FORT MCMURRAY, Alta.

Mr. Rick Caton
WOODLAWN, Ont.

Mr Darryl Chichak
EDMONTON, Alta.

Mr. Geoffrey Cook
SHERWOOD PARK, Alta.

Mr. J. Cumming
EDMONTON, Alta.

Ms. Anne Marie Downey
EDMONTON, Alta.

Ms. Linda Duncan
EDMONTON, Alta.

Ms. Christiane Eggert
PINCHER CREEK, Alta.

Ms. Vicky Filanovsky
EDMONTON, Alta.

Ms. Corrie Fordyce
EDMONTON, Alta.

Ms. Deborah Frigon
EDMONTON, Alta.

Mr Todd Gehring
MEDICINE HAT, Alta.

Ms. Jennifer Gladstone
CARNWOOD, Alta.

Ms. Kelly Gray
FORT MCMURRAY, Alta.

Mr. J. L. Griffiths
HINTON, Alta.

Mr. Brian Gusko
EDMONTON, Alta.

Mr. Arne Handley
MEDICINE HAT, Alta.

Mr. Kevin Harrocks
FORT MCMURRAY, Alta.

Ms. Mary Lou Harrynuck
BOYLE, Alta.

Ms. Sheryl Hatch
WANDERING RIVER, Alta.

Mr. Dennis Heise
BANFF, Alta.

Mr. Larry Heise
BANFF, Alta.

Mr. Lowell R. Holland
PINCHER CREEK, Alta.

Mr. Margaret Horton
WATERTON PARK, Alta.

Mr. Sheldon Hughes
HINTON, Alta.

Ms. Leela John
MEDICINE HAT, Alta.

Mr. Don Junol
FORT MCMURRAY, Alta.

Mr. Doug Kariel
CALGARY, Alta.

Mr. Dale Kemp
BOYLE, Alta.

Ms. Carolone Kutash
EDMONTON, Alta.

Ms. Michelle La Brosse
MEDICINE HAT, Alta.

Ms. Monica Lange
EDMONTON, Alta.

Mr. Ken Lau
EDMONTON, Alta.

Mr. Paul Lawrence
TWIN BUTTE, Alta.

Ms. Jeanne Lepine
EDMONTON, Alta.

Mrs. Gaileen Lyons
EDMONTON, Alta.

Mr. Tom Maccagno
EDMONTON, Alta.

Mr. Rob Macintosh
DRAYTON VALLEY, Alta.

Ms. Heather Marshall
EDSON, Alta.

Ms. Donelle Martin
CALGARY, Alta.

Mr. Loren Mathes
PINCHER CREEK, Alta.

Mr. Dave Mattern
SHERWOOD PARK, Alta.

Ms. Kristen Mattern
SHERWOOD PARK, Alta.

Ms. Fiona McAllister
BONNYVILLE, Alta.

Mr. Don C. McCabe
GRAND CENTRE, Alta.

Mr. Terrence Minoose
COLD LAKE, Alta.

Mr. Chris McCullough
WANDERING RIVER, Alta.

Mr. Gary McFarlane
MEDICINE HAT, Alta.

Ms. Jocelyn Mills
CALGARY, Alta.

Ms. Judy Minaker
LEGAL, Alta.

Mr. Jerry Morigeau
SHERWOOD PARK, Alta.

Ms. Gloria Musson
EDSON, Alta.

Mr. Ken Nelson
EDMONTON, Alta.

Mr. Garth Norris
EDMONTON, Alta.

Ms. Carolyn Ozero
BONNYVILLE, Alta.

Ms. Sussanne Ouellette
LEGAL, Alta.

Ms. Delin Sheehan
CARSTAIRS, Alta.

Ms. Sandra Paulgaard
CALGARY, Alta.

Mr. Richard Payne
STETTLER, Alta.

Mr. Neil Pederson
BOYLE, Alta.

Mr. Barry Pitterdrigh
REGINA, Sask.

Ms. Helen Plenshke
MAYERTHORPE, Alta.

Ms. Irene Proulx
HINTON, Alta.

Ms. Rosemary Puch
PINCHER CREEK, Alta.

Ms. Karen Rider
STETTLER, Alta.

Ms. Kelly Robson
HINTON, Alta.

Mr. Jim Rogers
FORT MCMURRAY, Alta.

Mr. Bill Romanchuk
EDMONTON, Alta.

Mr. Mark Rose
EDMONTON, Alta.

Mr. Brian Roth
EDMONTON, Alta.

Mr. Michael Roth
FORT MCMURRAY, Alta.

Mr. Wallie Samiroden
EDMONTON, Alta.

Mr. Leslie Schaupmeyer
HINTON, Alta.

Ms. Lynne Parney
CALGARY, Alta.

Ms. Dilis Soetaert
ST. ALBERTA, Alta..

Mr. Brian Staszenski
THORSBY, Alta.

Ms. Lee-Ann Stephenson
LEGAL, Alta.

Mr. Ken Stewart
CHATON, Alta.

Ms. Susan Sugden
COLD LAKE, Alta.

Ms. Dianna Thompson
EDMONTON, Alta.

Mr. James Thompson
EDMONTON, Alta.

Ms. Charlene Town
HINTON, Alta.

Mr. Jim Trask
EDMONTON, Alta.

Ms. Dinah VanDanzel
HIGH RIVER, Alta.

Mr. Dean Vanderstine
HINTON, Alta.

Mr. Andy Vollmerhaus
SEEBE, Alta.

Mr. Jeff Walters
CALGARY, Alta.

Mr. Gerrit Winkelaar
MEDICINE HAT, Alta.

Mr. Lub Wojtiw
EDMONTON, Alta.

Mr. Patrick Parent
EDMONTON, Alta.

Ms. Lorraine Sinclair
HINTON, Alta.